

This electronic thesis or dissertation has been downloaded from the King's Research Portal at <https://kclpure.kcl.ac.uk/portal/>



Calcutta Botanic Garden

Knowledge Formation and the Expectations of Botany in a Colonial Context, 1833-1914

Thomas, Adrian Peter

Awarding institution:
King's College London

The copyright of this thesis rests with the author and no quotation from it or information derived from it may be published without proper acknowledgement.

END USER LICENCE AGREEMENT



Unless another licence is stated on the immediately following page this work is licensed

under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

licence. <https://creativecommons.org/licenses/by-nc-nd/4.0/>

You are free to copy, distribute and transmit the work

Under the following conditions:

- Attribution: You must attribute the work in the manner specified by the author (but not in any way that suggests that they endorse you or your use of the work).
- Non Commercial: You may not use this work for commercial purposes.
- No Derivative Works - You may not alter, transform, or build upon this work.

Any of these conditions can be waived if you receive permission from the author. Your fair dealings and other rights are in no way affected by the above.

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Calcutta Botanic Garden:
Knowledge Formation and the
Expectations of Botany in a Colonial
Context, 1833-1914

Adrian Peter Thomas

Thesis submitted for the degree of PhD
King's College London, 2016

Calcutta Botanic Garden was founded in 1786 to acclimatise economic plants, but it quickly became the main institutional base for scientific botany in colonial India. However, it had to make a new start in 1833 after the Garden superintendent, Nathaniel Wallich, distributed its herbarium to botanists in Europe.

The thesis shows how the revival of the scientific project to investigate and catalogue the south Asian flora was the main priority for Wallich's successors, but depended on successful negotiation with the government. The central theme of the thesis is the tension between scientists, intent on their research, and sponsors, who need to demonstrate practical outcomes. It breaks new ground by focussing on how these issues were debated and resolved within a particular colonial scientific institution.

It argues that the Garden was able to attract the resources it needed for its scientific work by responding appropriately to government pressures: although its achievements in economic botany were limited, it successfully highlighted them, regularly citing the introduction of tea and cinchona; it reinforced its case by managing its site in ways that reassured the government.

The thesis also adds to our understanding of centre-periphery relationships. It argues that the Garden's role as an important nodal point in the global botanic network was key to achieving its objectives. It shows how the Garden was strengthened by its mutually supportive relationship with Kew Gardens, based on the close bonds that botanists formed with each other.

The thesis concludes by showing how, despite the Garden's achievements, the government gradually lost faith in the ability of botany to contribute to economic progress in India; in the twentieth century it increasingly turned to more specialist disciplines and institutions. The thesis therefore suggests that further studies of scientific institutions would enhance our understanding of how science continued to support and validate imperial rule.

Contents

List of Figures and Tables	6
Acknowledgements	9
Introductory Note	11
<i>Introduction</i>	21
The Garden superintendents and their identities	26
The formation and dissemination of botanical knowledge in India	31
Botany, imperialism and the expectations of the colonial regime	34
The structure of the thesis	41
Sources	42
<i>Chapter One</i>	
Situating Calcutta Botanic Garden	45
Conceptualising the Garden as a space and place	48
The place of the Garden in the networks it contributed to	52
Calcutta Botanic Garden and networks in India and the wider Indian Ocean world	59
The formation and communication of scientific and environmental knowledge through international networks	64
Using networks to exchange scientific and horticultural knowledge with local people, and to communicate with government officials	75
Conclusion	83
<i>Chapter Two</i>	
Botany and botanic gardens in India before 1833	85
Early European interest, crop transfer and the foundation	

of Calcutta Botanic Garden	86
William Roxburgh and his immediate successors, 1793-1817	93
Nathaniel Wallich's early years as Superintendent, 1817-1828	100
Conclusion	103

Chapter Three

Inertia, experiment and the restoration of a scientific capability, 1833-71	107
Creating 'a working scientific establishment'	107
Wallich's second period as Superintendent, 1833-46	110
Re-energising the Garden: the interventions of William Griffith and Joseph Hooker	126
The restoration of a scientific capability: Thomson and Anderson as superintendents	141
Conclusion	150

Chapter Four

The culmination of the taxonomic project and changing government expectations, 1871-1914	153
Setting the agenda: the views of Kew and the Government of India	154
King's first two decades, 1871-90	165
1890-1914: the reassessment of the Garden's role	176
Conclusion	185

Chapter Five

The utility of the garden	188
Plant transfer, natural resource policies and the Botanic Garden	190
Tea and other work in economic botany, 1820-60	195
Cinchona and other work in economic botany, 1860-1914	208
Conclusion	220

Chapter Six

Demonstrating the Garden's purpose: landscape, site management and visitor expectations	224
--	------------

Settling the form of the Garden: landscape, site management and visitor expectations	225
Labelling	244
Responding to visitors: creating a site for instructive and healthy relaxation	247
The Garden as a commemorative site	253
Conclusion	259
 <i>Conclusion</i>	 261
 List of Abbreviations	 274
 <i>Bibliography</i>	 275

List of figures and tables

Figures

Introductory Note

- | | |
|--|----|
| 1. Calcutta in relation to the Bay of Bengal. | 11 |
| 2. The location of the Botanic Garden: an early nineteenth century print showing the Superintendent's house. | 12 |
| 3. Calcutta in 1895, showing the location of the Botanic Garden. | 13 |
| 4. Plan of the Botanic Garden. | 14 |

Chapter One

- | | |
|---|----|
| 5. The location and dates of nineteenth-century botanic gardens in India (showing India's borders as they were in the 1850s). | 62 |
|---|----|

Chapter Two

- | | |
|--|----|
| 6. Carey's editions of Roxburgh's <i>Hortus Bengalensis</i> (1814) and <i>Flora Indica</i> (1832). | 97 |
|--|----|

Chapter Three

- | | |
|---|-----|
| 7. Wallich in distinguished company: British Honorary Members of the Botanical Society of Edinburgh. | 114 |
| 8. Wallich's tribute to William Griffith (and others) in Volume Three of <i>Plantae Asiaticae rariores</i> in 1832. | 121 |
| 9. The world of aristocratic patronage: some of the subscribers to Wallich's <i>Plantae Asiaticae rariores</i> . | 123 |
| 10. Wallich's prize specimen: <i>Amberstia nobilis</i> , drawn by Vishnu Prasad for <i>Plantae Asiaticae rariores</i> , vol. I, and an example in the Garden in 2013. | 125 |
| 11. Griffith's legacy: copy of his 1843 Report annotated by two of his successors (H. Falconer and A.T. Gage). | 130 |
| 12. John Forbes Royle after he had retired to Britain. | 132 |
| 13. Joseph Hooker in the 1850s. | 136 |
| 14. Calcutta awash: watercolour by John Arthur Armstrong showing Calcutta from the Strand during the cyclone of 5 October 1864. | 148 |

Chapter Four

- | | |
|---|-----|
| 15. A rulebook for efficient administration: the Indian Forest Department Code of Instructions, 1886. | 159 |
| 16. A page from the <i>Annals</i> , and an illustration by Lakshman Singh. | 172 |

Chapter Five

- | | |
|--|-----|
| 17. Carey's continuing presence: the bust outside the Agri-Horticultural Society's offices in Kolkata. | 196 |
|--|-----|

Chapter Six

- | | |
|---|-----|
| 18. A mid-twentieth century view of the Superintendent's House. | 226 |
| 19. The Superintendent's house with Calcutta in the distance on the opposite bank (hand-coloured aquatint by Robert Howell, after J. B. Fraser, 1824-8. | 228 |
| 20. Science inscribed on the landscape: Griffith's plans for order beds. | 229 |
| 21. The development of the Garden: the map of 1816. | 230 |
| 22. The development of the Garden: the 1845 map prepared by Griffith, showing the layout of the Garden in the early 1840s. | 231 |
| 23. The development of the Garden: the map of 1846. | 232 |
| 24. One of the earliest photos: Calcutta Botanic Garden in the 1850s. | 234 |
| 25. Lake in the Botanic Garden showing the effects of King's landscaping, still evident in 2013. | 240 |
| 26. The Herbarium, completed in 1883. | 242 |
| 27. Example of the labels being used at the Botanic Garden in 2013. | 246 |
| 28. Calcutta Botanic Garden, Christmas Day 1908; preparing for Christmas sports of the Calcutta associated tradesmen. | 251 |
| 29. The first rules, issued by M'Clelland in 1847. | 252 |
| 30. The monuments to Kyd and Roxburgh as they appeared in 2013. | 254 |
| 31. The monuments to Nathaniel Wallich and William Jack. | 256 |
| 32. The memorial to George King. | 257 |
| 33. Map showing the names King gave to the Garden's roads and avenues. | 258 |

Figures 4, 8, 9, 10, 16, 18, 20, 28, 29 and 33 are reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew; figures 2, 14, 19, 21, 22, 23 and 24 are © The British Library Board, and reproduced with their permission; figures 7, 11, 15 and 26 appear by courtesy of the Central National Herbarium, Kolkata; other photographs are by the author.

Tables

Introductory Note

- | | |
|---|----|
| 1. The Superintendents of Calcutta Botanic Garden, 1786-1925. | 15 |
| 2. Calcutta Botanic Garden Senior Staff, 1833-1914, showing dates of service. | 18 |

Chapter Two

- | | |
|---|-----|
| 3. Times when Wallich was absent from Calcutta 1817-33. | 100 |
|---|-----|

Chapter Five

- | | |
|---|-----|
| 4. The main strengths of the leading botanists who worked in India. | 188 |
|---|-----|

Acknowledgements

Researchers embarking on a new project depend in equal measure on access to information, and on the support and enthusiasm of others. I was fortunate to be based in London with its vast archives on botany and the colonial period. I am grateful for the access I was given, and particularly for the help and support of Antonia Moon and her colleagues at the British Library, and Kiri Ross-Jones and the archives staff at the Royal Botanic Gardens, Kew. I would also like to acknowledge the value of Richard Axelby and Savitri Preetha Nair's recent guide *Science and the Changing Environment in India, 1780-1920*, which made it much easier to find relevant material in the India Office Records at the British Library. More and more documents are also being made available on the Internet, and the teams behind the online projects listed in my bibliography have made my work a good deal easier.

I am most grateful to all those who have helped me. I should thank first Professor Peter Robb, who encouraged me to embark on the project in the first place. I found that there are plenty of enthusiasts for the history of botany, and I was fortunate to meet many of them at a conference on Wallich and Indian Natural History at the Natural History Museum when I started my research. I also much appreciated the welcome I was given by the Centre for World Environmental History at the University of Sussex, and the interest taken in my work by Henry Noltie and Mark Watson at the Royal Botanic Gardens, Edinburgh.

In Kolkata I was welcomed at the Botanical Survey of India and the Central National Herbarium by Dr Paramjit Singh and his colleagues, and given full access to their archives, close by the house where all the superintendents of the Botanic Garden had lived. Staff at both the West Bengal State Archives and the Agri-Horticultural Society were also very helpful, and I spent several fascinating days in the library of the Asiatic Society. In Delhi I was grateful to be able to consult material in the Indian National Archives, and much appreciated Deepak Kumar's warm welcome and

hospitality. Access to institutions in India was made easier by the assistance of Sujata Sen and her colleagues at the British Council, Kolkata. I am very grateful to them, to friends in Kolkata, and particularly to Professor Supriya Chaudhuri who made sure that I got access to Abhijit Mukherjee's thesis at Jadavpur University. I have also much valued the support and encouragement of friends and relations in Britain and New Zealand.

Lastly, there are two people whose contribution has been crucial. I owe much to the patient guidance and support of Jon Wilson, my supervisor at King's College, and I could never have completed this project without the intelligence, interest and understanding of my wife, Robyn.

Introductory Note

This note provides some basic facts about Calcutta Botanic Garden and the people who ran it.

The location and extent of the Garden

From the late eighteenth century until the early twentieth century Calcutta (now Kolkata) was the capital of British India. The city is on the River Hooghly, part of the Ganga (Ganges) delta, and is about a hundred kilometres from the sea (see map below).

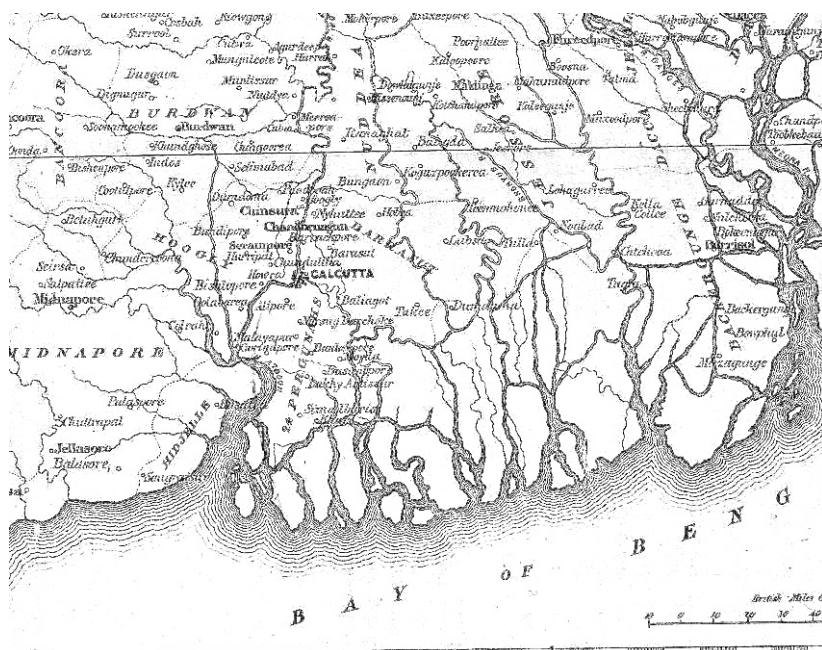


Figure 1. A nineteenth century map showing Calcutta in relation to the Bay of Bengal.

The river is wide and Calcutta was an important seaport until recently. In some ways the location is not dissimilar to London's, although the Bengali hinterland is far larger.



*Figure 2. The location of the Botanic Garden: an early nineteenth century print showing the Superintendent's house (on the left), with Calcutta in the distance on the opposite bank.
(© The British Library Board).*

The Botanic Garden is about six kilometres (four miles) downstream from the city centre, and on the opposite bank (see Figure 2). It has a kilometre and a half of river frontage and stretches nearly a kilometre inland. In the past, when most outsiders reached Calcutta by sea, the Garden was very prominent,¹ but once they arrived in Calcutta it was awkward to get to. Now it is less prominent as visitors nearly all arrive by air or rail, but there are two major bridges and it is easier to reach.

¹ Joseph Hooker in his *Himalayan Journals* (Vol. I, p.2) highlights the prominence of the Garden in his description of his arrival in 1848.

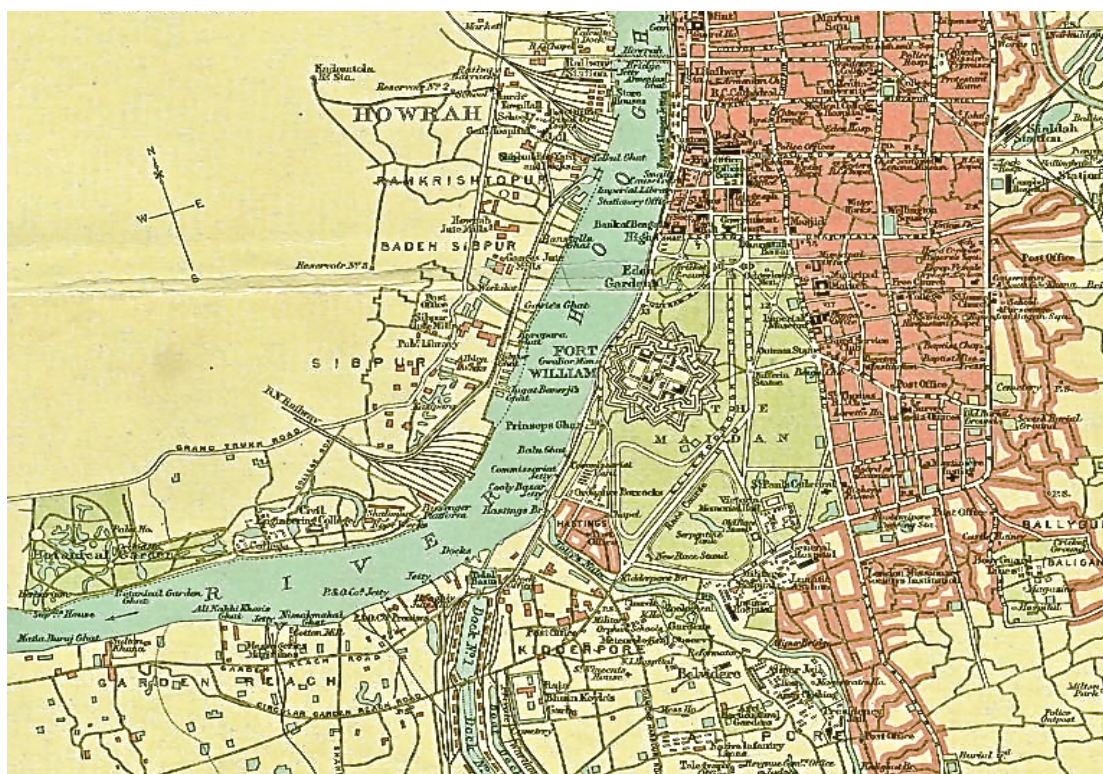


Figure 3. Calcutta in 1895, showing the location of the Botanic Garden in green, at the bottom left (from the *Imperial Gazetteer*, 1909 edition).

The Garden was founded in 1786 and has had a continuous existence on the same site ever since. It was established on a generous scale. When founded the area was 310 acres (125 hectares), but 40 acres were transferred to the Bishop's College (now Bengal Engineering and Science University) in 1828. It is comparable in size to Kew Gardens in London. Figure 3 gives an idea of the shape and layout. Calcutta was the first of a network of botanic gardens in India, the most important of which were at Saharanpur, north of Delhi, and at Ootacamund and Bangalore (Bengaluru) in south India. The Botanical Survey of India was set up in 1890 to coordinate botanical activities.

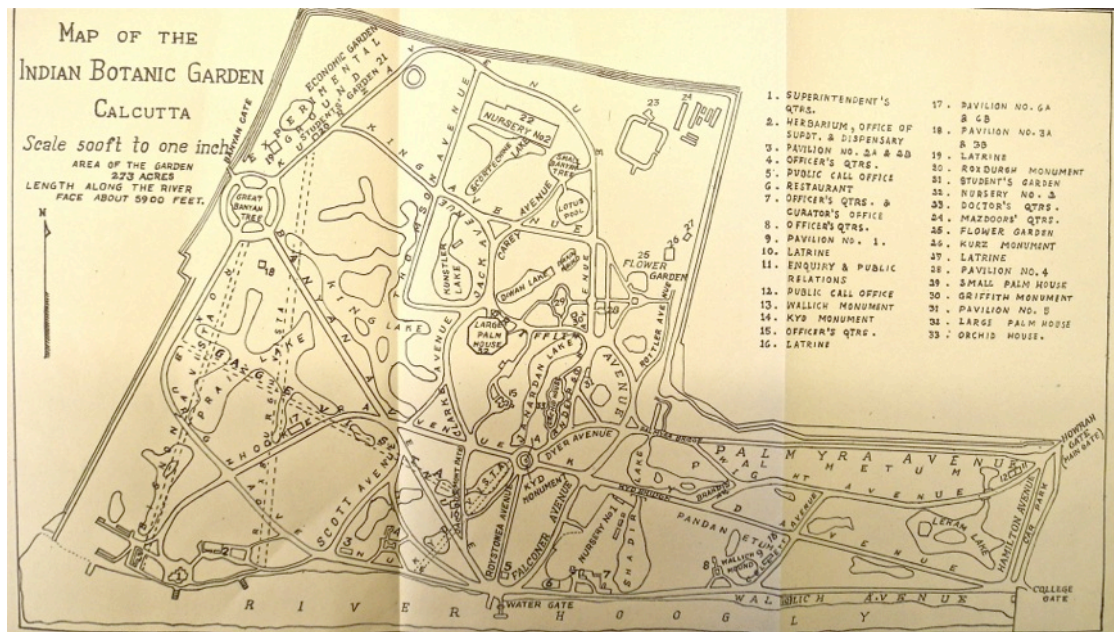

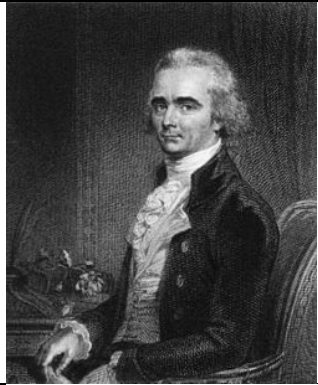





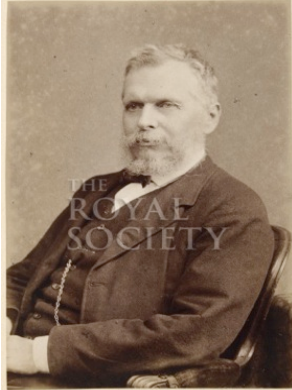


Figure 4. Plan of the Botanic Garden, c. 1960 (Reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew).

From 1793 to 1937 Calcutta Botanic Garden was run by full-time British superintendents, who were almost all botanically inclined surgeons from the Indian Medical Service. The two tables below list the superintendents and their supporting staff:

Table 1. The Superintendents of Calcutta Botanic Garden, 1786-1925

Name and Dates of Appointment	Date and place of birth	Died (age at death)	
1786-93 Lt Col Robert Kyd (part-time)	1746 Forfarshire, Scotland	1793 (47)	
1793-1813 Dr William Roxburgh FLS, FRSE	1751 Ayrshire, Scotland	1815 (64)	
1815-16; 1817-46 Dr Nathaniel Wallich FRS (VP), FLS (VP)	1786 Copenhagen, Denmark	1854 (68)	
(1842-44) Dr William Griffith FLS	1810 England	1845(34)	
(1846-48) Dr (later Sir) John M'Clelland	1805	1883 (78)	

1848-55 Dr Hugh Falconer FRS (VP)	1808 Forres, Scotland	1865 (57)	
1855-61 Dr Thomas Thomson FRS, FLS	1817 Glasgow, Scotland	1878 (61)	
1861-69 Dr Thomas Anderson	1832 Edinburgh, Scotland	1870 (38)	<p><i>Image courtesy Royal Botanic Gardens, Edinburgh</i></p> 
(1869-71) C B Clarke FRS, FLS (President)	1832 Andover, England	1906 (74)	<p><i>Royal Society image</i></p>  <p>MAULL & FOX, 1874 PICCADILLY, LONDON.</p>

1871-98 Sir George King FRS, FLS	1840 Peterhead, Scotland	1909 (69)	
1898-1905 Sir David Prain FRS (Treasurer) FLS (President)	1857 Fettercairn, Scotland	1944 (87)	
1905-25 Lt Col A T Gage FLS	1871 Aberdeen, Scotland	1945 (74)	

*Reproduced by kind
permission of the
Royal Botanic
Gardens, Kew*

Abbreviations:

FLS	Fellow of the Linnean Society of London	IMS	Indian Medical Service
FRS	Fellow of the Royal Society of London	VP	Vice-President

All were members of the IMS except Kyd and Clarke

Table 2. Calcutta Botanic Garden senior staff, 1833-1914, showing dates of service

	Super-intendent	Herbarium Curator	Garden Curator	Office	Others
1830	Nathaniel Wallich (1817-46)		George Potter	Oomanund Dutt (18? -1845)	Gorachand (Artist), Vishnu Prasad (Artist) Lutchman Singh (Artist, c. 1828 -1865) Kurrim Khan (Head Gardener) Shaik Mooty (Head of nursery)
			J Masters (1835-38)		Buxoo, Head Mali (1830s & 1840s)
1840	William Griffith (acting, 1842-44)		Ross (Head Gardener) Dougherty (Overseer)	Colly Koomer Mukherjee (1845-63?)	Prosunno Coomar Sein (Overseer, c. 1840-90)
	Hugh Falconer (1848-55)				
1850			Robert Scott (1850-1865)		
	Thomas Thomson (1855-61)				
1860	Thomas Anderson (1861-70)				
		Sulpiz Kurz (1864-78)	John Scott (1865-78)		
1870	George King (1871-98)				Sheik Shadir (Overseer, 18? - 1908)
		John Scott (1878-80)	Adolph Biermann (1877-80)		
1880		L J K Brace (1881-86)	Various		
		David Prain (1887-1898)	Various	Gopal Chandra Dutta	
1890			Robert Proudlock (1891-96)		
	David Prain (1898-1905)	Andrew Gage (1898-1905)	G T Lane (1896-1923)		
1900					
	Andrew Gage (1905-25)	Warwick Wright Smith (1908-11)			
1910		Charles Calder (1912-25) M. S. Ramaswami (Acting, 1913-14)			

There are three final points to make: one concerns nomenclature – always a slightly complicated matter when writing about Indian history. In general I have followed the practice of other historians in using contemporary names – Calcutta, Bombay and Madras rather than the modern Kolkata, Mumbai and Chennai, for example. Where I think that there may be uncertainty I give both the current and historical name. Calcutta Botanic Garden itself has had a number of names. Kyd used both ‘botanic’ and ‘botanical’ and later we see ‘garden’ and ‘gardens’. Locally it was known as ‘kompani bagh (or bagan)’ i.e. the East India Company’s Garden. In 1859 it became the ‘Royal Botanic Garden, Calcutta’, though sometimes Sibpur, the nearest village, or Howrah, was substituted for Calcutta. I have used ‘Calcutta Botanic Garden’ or ‘the Garden’ throughout for the sake of consistency. After Independence it became the Indian Botanic Garden; in 2009 it was again renamed, and it is now “Acharya Jagadish Chandra Bose Indian Botanic Garden, Kolkata”. It is also worth remembering that colonial India included what are now Pakistan, Bangladesh, and sometimes Burma (though not Sri Lanka or Nepal). Nineteenth-century colonial botanists were interested in the entire area, and I have used India and South Asia interchangeably to describe it. It should also be noted that I have used the shorthand “Kew” for the British Royal Botanic Gardens, Kew.

Secondly, botany has its own vocabulary. I have tried to avoid using technical botanical terms, and have explained them where necessary. There is an important distinction throughout this work between the scientific systematic botany that was the priority of the superintendents, and economic botany. Systematic botany groups plants for the purpose of classification. That involves the practice of taxonomy, ‘the identification, description, and naming of organisms.’² Economic botany, in contrast, is concerned with the transport, investigation and acclimatisation of plants for economic or practical purposes. I have assumed that most readers are familiar with the scientific naming convention established by Linnaeus whereby all plants (and other living things) are given a binomial name with the genus (with an initial capital) first, and the individual species (lower case) second – thus Indian hemp is *Cannabis indica*.

² Richard Fortey, *Dry Store Room No. 1: The Secret Life of the Natural History Museum*, (London, 2008).

Thirdly, I have used a variety of measures in the text. Pre-colonial India had its own system of weights and measures, and the British introduced their units such as miles and acres. It has made sense to retain these measures in places, but otherwise I have used the international metric equivalents for wider comprehensibility

Calcutta Botanic Garden: Knowledge Formation and the Expectations of Botany in a Colonial Context, 1833-1914

Introduction

Calcutta Botanic Garden is remarkable in having had a continuous institutional history on the same site since the late eighteenth century. It was founded well before any other major botanic garden in Asia,¹ and although renamed, it is still one of the principal centres of Indian botany. The Garden was established to provide technical expertise for the introduction and exchange of economically useful plants, and that was the main reason why successive governments funded it. However, the botanists who were appointed as superintendents had a strong sense of professional identity, and close links to metropolitan science. Their priority was to use the Garden as a base for expanding European knowledge of the Indian flora.

Sometimes these competing views about the purpose of the Garden led to strains in the relationship between botanists and officials, and one of the main aims of the thesis is to examine how they were resolved. The government tried to appropriate the concerns of botanists as part of its efforts to validate imperial rule, and in response the Garden contributed to various economic “improvement” programmes. However, the officials who sanctioned the funds were subject to a variety of influences so they never had unfettered control over the Garden. As a result, the superintendents were able to create enough scientific space to complete their project to provide an overall description of the flora by the end of the nineteenth century.

¹ Calcutta Botanic Garden was founded in 1786; Buitenzorg (now Bogor) in Java followed in 1817, Peradeniya in Ceylon (Sri Lanka) in 1822 and Singapore in 1859.

There have been a number of accounts of the foundation and early years of Calcutta Botanic Garden, but historians have paid less attention to its subsequent trajectory.² For that reason this study starts in 1833. In a sense botany in India started anew then, after the superintendent, Nathaniel Wallich, distributed the Botanic Garden's entire herbarium to European botanists, and thus removed the main reference point for botanists working in India (see Chapter Two).

In the following thirty years the Garden did valuable economic work but it took a long time to rebuild the herbarium. The thesis will examine how the Garden began to recover its scientific momentum in the 1860s, and managed to become the main base for investigating and cataloguing the Indian flora in the 1880s and 1890s. By 1914, however, official support for botany was declining. The Government of India saw little scope for further crop introductions, and the British project to catalogue and classify the Empire's plant life seemed to be almost complete. Consequently the start of the First World War, a turning point everywhere, is an appropriate place to end. Calcutta Botanic Garden and the Botanical Survey of India continued to receive modest funding, but after 1914 they were no longer very significant institutions for the study of science in colonial India.

Building on the work of other historians of natural history, the thesis aims to contribute new insights by focusing on a particular site, and by viewing the history of colonial science through the prism of one institution. In the process it aims to elucidate some of the historiography of colonial science, and consider how colonial attitudes changed in the nineteenth century. In 1841 the surgeon John M'Clelland, writing in the *Indian Journal of Natural History*, questioned whether many plants might not have been, '... obtained and distributed, as well, even if the Calcutta Garden had never existed?'³ He recognised that the Garden's existence was not inevitable, and part of the aim of this study is to identify achievements that would have been impossible without the Garden.

² There are, for example, detailed accounts of the establishment of Calcutta Botanic Garden in Ray Desmond, *The European Discovery of the Indian Flora* (Oxford, 1992), George King, 'A Short Account of Colonel Kyd', *Annals of the Royal Botanic Garden, Calcutta*, 4 (1893) and I. H. Burkill, *Chapters on the History of Botany in India* (Delhi, 1965).

³ *The Indian Journal of Natural History*, Vol. II (1841), 289.

This introduction will outline the main conceptual questions that are addressed in the thesis. It will also look in more detail at three issues that are important in order to understand some of the arguments. Firstly it will consider the sense of identity and motivations of the superintendents of the Botanic Garden. Secondly, it will provide some detail on nineteenth-century botanical taxonomy, and the challenges of obtaining and publishing accurate results. Finally it will examine the superintendents' involvement in the colonial project to know India, and the degree to which they can be regarded as imperialists.

Studying the history of the Garden shows how scientific knowledge formation actually took place in British India. At the same time it reveals what contribution the Garden made to the overall British project to know India's flora and to transfer useful plants. An important purpose of the thesis is to analyse 'diffusionist' arguments and to see whether knowledge was in fact co-produced, with colonial scientists and their collaborators influencing the 'metropolis' in their turn. It will also examine how far categories such as 'colonial scientists' actually correspond to the reality of botany in India.

Other issues concerning knowledge formation are examined as well. A major concern in the nineteenth century was the extent to which higher-level work such as the classification of plants should take place in Europe or overseas. That in its turn involved the more practical point of whether overseas botanic gardens should develop large herbaria, and thus, in Latour's sense, become a 'centre of calculation.' How Calcutta Botanic Garden grappled with that issue is a major theme of this work. A more fundamental matter, which will be treated later in this introduction, was the validity of the taxonomic systems used to classify plants. Their "accuracy" could have an important influence on the credibility of the work of botanists in India.

The small number of British botanists in India did not have the capacity on their own to process all the plants that were collected, or to publish their findings. The thesis will therefore consider the extent to which knowledge was co-produced with other European and Indian informants and collaborators. In Chapter One there will also be a detailed analysis of the role of scientific networks, with which the Garden

worked closely from its earliest years, and the significance of Kew's influence and support will be a key topic.

Looking at the work of botanists also enables us to test the concept that Europeans used their increasingly detailed knowledge of scientific processes as a way of asserting their superiority in the nineteenth century.⁴ Related to that is the question of how much they attempted to use science to mould Indian minds, which was a continuing theme of the work of the Garden, and of contemporary bodies such as the Agricultural Society. The thesis also provides examples of the arguments used by the British to explain their lack of success when the uptake of the new practices they proposed was disappointing.

There was a spate of crop transfers after Europeans first reached America, and the contribution of the Botanic Garden has to be assessed as part of that historical process.⁵ Economic botany was the main reason for founding the Botanic Garden, and the thesis will look at efforts to improve the productivity of Indian agriculture and forestry. It will consider how successful the Garden was in meeting the expectations of British administrators who hoped that assigning funds to the Botanic Garden would lead to the introduction of new crops, and the improvement of varieties already cultivated in India. That would help them to extract more revenue from agriculture, and increase exports. The thesis will also consider whether senior officials and the superintendents often agreed on what the economic agenda for the Garden should be, or whether they tended to hold differing views.

Some writers have placed colonial botanic gardens firmly within an exploitative imperial network, coordinated by Kew and aiming to increase the productivity of the Empire by an organised system of plant transfer. Lucile Brockway, who first advanced this view over thirty years ago, emphasised the political effects of scientific research, which generated and disseminated useful scientific knowledge, and facilitated exchanges of energy, manpower and capital on a worldwide basis and on an unprecedented scale.⁶ The thesis will consider whether the evidence from the

⁴ Michael Adas, *Machines as the Measure of Man: Science, Technology and Ideologies of Western Dominance* (Ithaca 1989).

⁵ Alfred Crosby, *The Columbian Exchange* (Westport, 2003).

⁶ Lucile Brockway, *Science and Colonial Expansion* (New York, 1979).

Botanic Garden supports the case for viewing the imperial botanical network as an efficient exploitative system. Finally, it will assess another viewpoint, that colonial botany was a more complicated exercise, situating plants within a 'volatile nexus' of science, commerce, state politics (and personal ambition), and how in the process, India itself was 'commoditised' and marketed.⁷ That will also extend to considering the importance of horticulture, whose practice underlay many of the other functions of the Garden. It will consider how the Garden related to the horticultural trade and the extent to which it was able to benefit from the Victorian enthusiasm for natural history.

Viewing the relationship of a particular institution with the government provides an excellent opportunity to observe how the policies and approaches of the colonial state changed during the nineteenth century. The thesis will note how ideas about the state's role and ability to improve economic life altered in parallel with the development of a different approach to communication and bureaucratic accountability. At the same time the history of the Garden offers an opportunity to see how notions of scientists and the increasingly specialist advice that they could offer changed between 1833 and 1914.

Importantly, the thesis will make it clear that the Botanic Garden involved more than just economic botany and scientific investigations. Studying it also raises questions of colonial attitudes to space and place, and the distinctiveness of the Garden's site, which will be explored further in Chapter One. It will note that from the very start the name 'botanic garden' introduced an aesthetic dimension, and it will investigate how that influenced the progress of the Garden. That will involve a variety of questions, including the influence of Victorian ideas of the role of parks, the difficulties involved in bringing colonial space under control, and colonial views on how tropical areas should be presented. The thesis will also consider the work of those such as David Arnold who put forward a nuanced view of science's imperial role, and examine it not only as a means of colonial appropriation, but also as a significant factor in the scenic depiction and understanding of India.⁸ Another need is to assess whether the Garden's continuous physical existence led to the creation of

⁷ David Arnold, 'Plant Capitalism and Company Science: the Indian Career of Nathaniel Wallich,' *Modern Asian Studies* 42, 5 (2008), 899-928.

⁸ David Arnold, *The Tropics and the Travelling Gaze: India, Landscape and Science, 1800-1856* (Seattle, 2006).

strong corporate traditions, and whether that contributed to its primacy amongst similar institutions in India. Chapter Six will consider in more detail the extent to which the landscaping of the Garden displayed imperial themes.

Three other issues concerning space and networks will also be important. The first is the span of the Garden's work, and the extent to which it claimed responsibility for all botanical work done in India, and indeed in the wider Indian Ocean region, all of which was originally part of the East India Company's assigned trading area. The second point of interest is how the British interpreted tropical climates, which affected how the Botanic Garden was regarded both in India and in Britain. Finally, the thesis will also investigate what we can learn from the Garden about how a colonial community functioned, and how the superintendents made use of history and memorials to highlight the significance of the Garden.

The Garden superintendents and their identities

The Introduction now turns to the three areas that need to be analysed in more detail. We start with the identities of the superintendents, as much of the thesis is structured around their tenures. Whilst many others were involved, the superintendents were usually the leading agents of change at the Botanic Garden, so a focus on them helps to clarify the scientific and technical management of the Garden, as well as the relationship with the government. It was the superintendents who were instrumental in expanding the Garden's network internationally, and in initiating collaboration with other botanists and botanical institutions in India. At the same time, they developed close relations with Kew Gardens. The departure of one superintendent and the arrival of another were often important in causing the government and Kew to think about the direction in which they wished the Garden to go. The superintendents all left significant amounts of correspondence, and many wrote detailed reports. We therefore know a lot about their viewpoints and activities, and how they wanted to be regarded. As a result it is possible to compare their identities and their characteristics as a historical group, and to investigate their shared ideas.

Identities can be based on social position, religious beliefs, nationality, political views, educational background, membership of a profession, family traditions of service and much else. The superintendents had a lot in common. Most came from a middle class or professional background, although education was more important than social status. There were limits, however: when three possible candidates for the post of Superintendent were referred to Thiselton Dyer in 1906, he wrote: ‘... I think Gammie, with all respect to his merits, must be set aside as scarcely adequate to the post either by social position, training or performance.’⁹ Gammie was a self-taught botanist who had grown up in India. By 1906 he was a lecturer at Poona College, but Thiselton Dyer still cited his lack of social position as the first bar to considering him even though his lack of university education might have been a greater objection.

Nearly all of the superintendents were qualified surgeons and members of the Indian Medical Service (IMS). Perhaps more notably, for sixty-four of the eighty-one years between 1833 and 1914, the Garden was run by Scots. Only Wallich, who was originally Danish, and three people who acted for short periods, (Griffith, M’Clelland and Clarke) were not Scottish. That reflected the fact that Scots had better access than the English to university education for much of the nineteenth century, and many of them trained as doctors. All doctors had to study botany, in order to recognise the plants from which herbal remedies were prepared, and botany was particularly well taught at the Universities of Edinburgh, Glasgow and Aberdeen. The small number of institutions through which Scottish botanists passed meant that they often learned from the same teachers,¹⁰ and there were other connections that encouraged a sense of cohesiveness as a group. Thomson’s father, for example, was a close colleague of Sir William Hooker and he went to school and to Glasgow University with Joseph Hooker.¹¹

Scots had a long tradition of going on to serve in the Indian Medical Service (IMS).¹² Most of the superintendents had decided that they wanted to become botanists after

⁹ RBG Kew DC 158: Thiselton Dyer to Holderness, India Office, 27th January 1906.

¹⁰ Henry Noltie’s paper, ‘A botanical group in Lahore, 1864’ (*Archives of Natural History*, Vol. 38, No. 2 (2011), 267-277) provides an excellent example of such connections.

¹¹ Jim Endersby, *Imperial Nature: Joseph Hooker and the Practices of Victorian Science* (Chicago, 2008), 50.

¹² The IMS recruited British medical graduates to serve as both military and civilian surgeons in India. It had a strength of about 850 for most the nineteenth century, about forty per cent of whom were Scots – see Crawford, *History of the Indian Medical Service*, 197-221.

they left university. Academic posts in Britain were scarce however, and it was rare for a medical graduate to have a private income, so joining the IMS was one of the few ways for aspiring botanists to achieve their ambition. There was no guarantee that they would be able to practise botany, but the East India Company did use the Service as a convenient source of scientific expertise, choosing surgeons who demonstrated real interest and ability in their particular field. Most of the Calcutta superintendents were fortunate in being able to specialise as botanists early in their careers.

Their shared Scottish-ness often meant that the superintendents had similar standards and values. The Scottish religious background was also distinctive. The superintendents' correspondence shows that several of them supported Darwin's views, but reveals little about their religious beliefs. However, they all came from a Presbyterian background that tended to emphasise democratic principles, and the importance of hard work and self-discipline.¹³ In the case of the Botanic Garden, it would be wrong to suggest that the superintendents who were not Scottish were any less hardworking or committed to their science, but none of the Scottish superintendents was as respectful of authority and hierarchy as Wallich was.

By the 1830s scientists were becoming a defined group,¹⁴ with membership dependent on recognised expertise in a particular field. Botanists regarded themselves as scientists, and their focus on advancing knowledge put them in a different category to those surgeons who did routine medical work. Scientific posts in India tended to be more prestigious because the specialist knowledge of scientists was potentially useful in addressing the technical and economic issues that could preoccupy very senior officials.¹⁵ But it was not simply scientific competence that was required. A superintendent also needed to be fit and active in order to collect and supervise field operations, systematic in order to compare and record, knowledgeable in order to classify, and practical in order to grow plants. Finally he had to have good social skills in order to impress visitors, and to present the Garden as a purposeful organisation. However, the Government did not always find it easy to recruit a

¹³ Geoffrey Cantor, *Quakers, Jews and Science* (Oxford, 2005) describes how science offered comparable opportunities to people from other denominations.

¹⁴ William Whewell introduced the use of the word "scientist" in 1833.

¹⁵ David Arnold, *Science, Technology and Medicine in Colonial India* (Cambridge, 2000), 61.

botanist with the full range of skills, despite the large house, generous salary and range of high-level contacts - quite different from what an ordinary regimental doctor might expect.¹⁶ By British standards the salary of Rs.1,500 (approximately £150) per month was certainly generous. It was, for instance, more than that of the Director at Kew. In the 1840s Sir William Hooker was drawing £66 per month, and Thiselton Dyer was paid £100 per month in the 1880s.¹⁷ There was also a very large gap between the Superintendent's salary and what other staff earned.¹⁸

These terms of service reassured the superintendents that they were seen as the most important botanists in India, and encouraged them to do significant botanical work.¹⁹ George King argued that successful botanical research involved a long-term commitment:

A man must be placed to some extent beyond care and worry to do good scientific work ... Science cannot be pursued in the tropics on a crust of bread, as it is by some people supposed to be pursued in Europe.²⁰

That argument had carried weight for many years, but as circumstances changed at the end of the nineteenth century (see Chapter Four) the value of the Superintendent's salary was eroded and never recovered its former value.

Botanists worldwide had a particular agenda when they constructed scientific knowledge. From the time of Linnaeus until the later nineteenth century, they were largely agreed that their priority was to discover, describe and classify the world's plant life.²¹ Botanists in India saw themselves as the South Asian representatives of that enterprise. Jean Baptiste Pierre's attributed statement sums up well the commitment and sense of mission of the best nineteenth-century botanists: *Me*

¹⁶ D. G. Crawford, *History of the Indian Medical Service* (London, 1914), 356.

¹⁷ Richard Drayton, *Nature's Government: Science, Imperial Britain, and the 'Improvement' of the World* (London, 2000), 243.

¹⁸ In the mid-nineteenth century the European Garden Curator got Rs.200 per month, the Head Clerk around Rs.120, and the artists Rs.40-60. At the bottom of the pyramid were the garden labourers who only earned Rs.5 per month.

¹⁹ The superintendents in Calcutta were also able to focus on botany whereas important botanists in West and South India like Gibson, Wight and Cleghorn had to switch between scientific and medical posts.

²⁰ National Archives of India, Medical B, Proceedings 94-96: King's letter No. 50-G of 8th November 1893 to Secretary, Government of Bengal, Finance Department in Home Department.

²¹ Drayton, *Nature's Government*, 141; Endersby, *Imperial Nature*, 137-8.

*reposer, mais je n'en ai pas le temps. Il y a tant à faire en Botanique et la vie est si courte.*²² (I do not have time to rest: there is so much to do in Botany, and life is so short.) The botanists' investigations were encouraged by the Victorian enthusiasm for natural history, and their publications in turn sustained that enthusiasm.²³

The thesis will consider how far this strong identification with their specialism was the driving force for European botanists in India. Most of them were enterprising and ambitious. They were aware, however, that professional life in India might involve higher risks, as well as greater rewards. Disease was a constant danger and their correspondence is full of references to illnesses.²⁴ Wallich, Falconer, Thomson, Anderson and King all had prolonged periods of leave in Britain to 'recover their health.' Griffith and Anderson both died before they were forty. Only at the end of the nineteenth century did the improved understanding of tropical diseases mean that health problems ceased to be a limiting factor in what the superintendents could do.

Even so, the possibility of achieving a measure of scientific immortality by finding and naming new species, and by publishing memorable accounts of their discoveries, were important motivating factors. As Janet Browne has noted, 'The great majority of British naturalists of the eighteenth and nineteenth centuries in fact considered foreign organisms much more exciting and interesting than those found at home.'²⁵ Their main loyalty was to their profession because they would ultimately be judged by the quality of their scientific work. Their correspondence supports the view that none of their other identities – as middle-class Scots, or as IMS officers, or as university-educated men – was as significant to them. Their social networks, their activities on leave and their work after retirement told the same story (See Chapter One).

²² Inscribed on the memorial in Ho Chi Minh City (formerly Saigon) to the French botanist, Jean Baptiste Pierre (1833-1905). Pierre worked in the herbarium at Calcutta for a short time in the 1860s.

²³ David E. Allen, *The Naturalist in Britain: A Social History* (Harmondsworth, 1978), 73 ff.

²⁴ Crawford, *Indian Medical Service*, contains detailed statistics on how many surgeons died in India.

²⁵ Janet Browne, 'Biogeography and Empire' in Jardine, Secord and Spary, *Cultures of Natural History*, 306.

The formation and dissemination of botanical knowledge in India

*'Systematics is a profoundly historical discipline, and we forget this at our peril.'*²⁶

The second matter to be analysed in detail in this Introduction is the process of botanical knowledge formation and how botanists worked in India. Knowledge formation started with identifying and classifying the flora. In the early nineteenth century there were several more or less formal surveys of designated territories. These surveys formed part of a wider movement, as '... military and civilian officials of the East India Company undertook a massive intellectual campaign to transform a land of incomprehensible spectacle into an empire of knowledge.'²⁷ In practice these European efforts to describe India were often less accurate than officials thought at the time,²⁸ but the surveys did provide an opportunity for botany to integrate itself into government activity. Botanists were sometimes assigned to carry out specific surveys in the wake of British military campaigns, as Wallich did in Nepal in 1820-21 and in Burma in 1824-25. However, British investigators and botanists could not do all the collecting over such large areas, and the superintendents of the Botanic Garden inevitably relied on other collectors: there were many other Indian and British people who participated in botanical knowledge formation.

The botanists did reserve to themselves the actual classification and description of the collections. At first, that was done according to the Linnaean system, which had been taught to Roxburgh and Wallich. It was an "artificial" system, based only on the reproductive features of a plant. It allowed plants to be slotted into categories quickly and easily if they were in flower, but because it did not take into account other characteristics it often placed unrelated plants together, and related ones apart. After about 1810 more scientific "natural" systems gradually came into use, and formed part of the education of the superintendents who came after Wallich. The virtues of the various systems were long disputed, however, and that reduced botany's credibility as a means of systematically ordering the world.²⁹

²⁶ Stevens, P. F. (2001 onwards). Angiosperm Phylogeny Website (<http://www.mobot.org/MOBOT/research/APweb/>) Version 12, July 2012. Accessed on 26th February 2014.

²⁷ Matthew Edney, 'The Ideologies and Practices of Mapping and Imperialism' in Irfan Habib and Dhruv Raina, (eds.), *Social History of Science in Colonial India* (New Delhi, 2007).

²⁸ See for instance Matthew Edney, *Mapping an Empire: the geographical construction of British India, 1765-1843* (Chicago, 1997).

²⁹ Endersby, *Imperial Nature*, 170-194.

It is important to note that these were only two of many possible ways to categorise. Michel Foucault has highlighted the significance of language in the discussion of ‘science,’ and pointed out that western knowledge was organised in a different way until the seventeenth century, with religious, traditional and philosophical ‘truths’ competing. Only in the later seventeenth and eighteenth centuries did science become concerned with categorisation, with scientific reason being privileged above other ways of organising knowledge. However, that approach was gradually replaced in the nineteenth century by a search for underlying principles, such as Darwin’s insights into evolution, and Pasteur’s into microbiology and bacteriology.³⁰

Foucault’s views have a particular application to taxonomic botany, with its long, but not entirely successful, search for a precise language. That, in turn, had its effects in India, and the thesis will show that botanists remained committed to a taxonomic categorisation project to the end of the nineteenth century. The natural system proved in the end to be more satisfactory for “experts” who wanted to order the world in a certain way, as it enabled them to talk more easily to each other. But Foucault and Bruno Latour³¹ have both pointed out that there is no objective reason to regard it as a superior taxonomic approach.

Science methods are therefore more mutable, less accurate and less “objective” than many botanists and others believed. As Paul Feyerabend argues:

There is no ‘scientific method’; there is no single procedure or set of rules that underlines every piece of research and guarantees that it is ‘scientific’ and, therefore, trustworthy ... Scientists revise their standards, their procedures, their criteria of rationality as they move along, and perhaps entirely replace their theories and their instruments and enter new domains of research.³²

That was as true in botany as in other fields, and botanists found the living world ever more complicated in practice. Samples were often poor, written information was sparse and difficult to interpret, and many plants hybridised. As a result, assigning

³⁰ Michel Foucault, *The Order of Things: an archaeology of the human sciences* (London, 2001).

³¹ Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Milton Keynes, 1987).

³² Paul Feyerabend, *Science in a Free Society* (London 1978), 98, quoted by Vandana Shiva in ‘Reductionist Science as Epistemological Violence,’ 234.

new species to their “correct” genus and family proved difficult, and floras regularly needed revision.³³ Even Sir Joseph Hooker is reported to have said that his magisterial *Flora of British India* was ‘past praying for in the matter of error in detail, from bad identifications, bad specimens and bad examination.’³⁴ This lack of accuracy posed a particular problem for botanists. As notions of science and the role of scientists changed during the nineteenth century (see Chapter Four), other sciences came to be seen as more precise and therefore reliable.

The way in which botanists carried out their work was of key importance. David Livingstone has reminded us that science is a cultural practice: ‘There is no scientific rationality that is independent of a tradition’s procedures, customs and performances – that is, of the practical traditions of knowledge making.’³⁵ Jim Endersby has similarly shown how a close examination of Joseph Hooker’s actual practice helps to explain his whole career and the nature of his scientific thinking.³⁶ Endersby argues that ‘... focussing on what naturalists *did* gives us a better understanding of the nature of science because studying practice illuminates and connects everything.’³⁷

During the eighteenth century, the European emphasis on experiment and empirical validation led to ever-stricter standards of observation, measurement, testing and recording. That in turn led to innovations in scientific instrumentation associated with watch and glass manufacture.³⁸ The improved thermometers, barometers, and microscopes that resulted played an important role in enhancing the confidence of botanists to know and understand the places where plants grew, and are often referred to in accounts of surveys, such as Joseph Hooker’s investigations in Sikkim.³⁹ One of the aims in this study is take a similar approach to the practices of Hooker’s fellow botanists in India.

³³ The advent of DNA testing has highlighted past inaccuracies and made further revision necessary.

³⁴ *Journal of Indian Botanical Society*, 9, 1930, 141-2, quoted in Ray Desmond, *The European Discovery of the India Flora*, 324.

³⁵ David Livingstone, *Putting Science in Its Place: Geographies of Scientific Knowledge* (Chicago, 2003), 45.

³⁶ Endersby, *Imperial Nature*, 6-7.

³⁷ *Ibid.*, 7.

³⁸ Adas, *Machines as the Measure of Man*, 263.

³⁹ See Joseph Hooker’s *Himalayan Journals*. Hooker not only collected vast numbers of plants but also produced important maps and ethnographic information.

Most superintendents were also aware of the need to publicise their findings. Roxburgh was a pioneer in publishing finely illustrated works as well as more systematic accounts. His successors, including Carey, Voigt⁴⁰ and Griffith, built on Roxburgh's systematic works, whilst Wallich produced more illustrated volumes. The thesis will look at later efforts to publish really comprehensive accounts of the Indian flora. It will also assess the importance of publishing in overall knowledge formation, and what contribution the Botanic Garden was able to make to these efforts

We should note also that intelligent botanists not only learned about plants but also took an interest in how and where they grew, and in that sense they played a role as early environmentalists.⁴¹ Both Roxburgh and Wallich were concerned about deforestation and its effect on rainfall. The story of the Garden is closely connected to European reactions to the tropical environment and cannot be told without considering the effects of natural phenomena such as cyclones and diseases. These issues will be discussed further in Chapter One.

Botany, imperialism and the expectations of the colonial regime

We now turn to a third issue that needs to be looked at in detail, how botany as practised in India related to the colonial régime, and what expectations that régime had of botanists. In considering these questions it is important to bear in mind that colonial power was often reactive rather than coherent and focused. Neither the East India Company, nor its successor imperial government, made many overt statements about science, so it is necessary to examine key moments to throw light on official priorities, and to understand who was able to influence what happened. The thesis looks at each occasion when a Garden superintendent retired or died. The government then had to appoint a successor, and that was sometimes a long drawn out or disputed process. Examining such interventions also helps us to understand how administrators weighed up botany's claim to resources against other scientific and technical activities, and later against other institutions, such as the Imperial Museum.

⁴⁰ See Chapter One for details of Voigt's work and Chapter Two for Carey's publishing.

⁴¹ Richard Grove, *Ecology, Climate and Empire: colonialism and global environmental history, 1400-1940* (Cambridge, 1997).

Wise superintendents understood the complexity of government and societal expectations. The thesis therefore argues that they created the sort of site that officials wanted, and did some work that would benefit their wider society. In return, they gained a degree of freedom to pursue their research interests. Once the Garden was established, the strategies of the superintendents ensured that its existence was never questioned, even though its budget was reduced at one stage. The close contacts that the superintendents had with government officials meant that botany was inevitably implicated in the colonial project to “know” India, and to exert imperial control. Since the 1960s historians in both India and the west have recognised science as a significant element in the colonial power relationship. Bernard Cohn has highlighted what happened in practice, and drawn attention to the British need for ‘investigative modalities to collect facts,’⁴² most relevantly the survey and enumerative modes in the case of botanical investigation. That was a valuable insight, but more recent scholarship has questioned Cohn’s monolithic view of colonial power. The thesis considers whether there is evidence for Dane Kennedy’s alternative view that such power was more often ‘plural and particularised.’⁴³

To some extent, British feelings of superiority over colonial peoples were based on the supposedly more “sophisticated” nature of European science, particularly physics, surveying, geology and natural history.⁴⁴ In that sense science became complicit in encouraging oriental stereotypes, and it was only at the end of the nineteenth century that British officials began to accept and encourage the work of western-trained Indian scientists (see Chapter Four). Because officials often regarded science as a sign of civilisation, they did not object to some of the Botanic Garden’s budget being devoted to the scientific investigation of the Indian flora. European cultural expectations that a botanic garden should be an exemplar of order and beauty were another reason why the Botanic Garden did not have to restrict itself to economic botany. The gardens could also reinforce the prestige of colonial governments by showing that they could grow what they wished wherever they wished, as will be discussed in Chapter Six.

⁴² Bernard S. Cohn, *Colonialism and its Forms of Knowledge*, (Princeton 1996)

⁴³ Dane Kennedy, ‘Imperial History and Post-Colonial Theory’, *Journal of Imperial and Commonwealth History* 24, 3 (Sept 1996) p. 353.

⁴⁴ Adas, *Machines as the Measure of Man*, Introduction.

There were certain factors that made the practice of botany in India distinctive. In the first place, the botanic gardens were directly funded by the government, which caused them to be different to, and in a sense more modern than, the much smaller gardens in Britain, which were traditionally funded by a variety of organisations. Indeed, it has been suggested that it was in India that the British worked out some of their theories and approaches to government, before introducing them in Britain.⁴⁵ It could even be argued that the Calcutta Botanic Garden was a model for Kew: only in 1845 did Kew Gardens begin to compare in size with the Calcutta.⁴⁶ Another distinctive feature in India was the status of botanists. It was normal for British officials in India to report directly to the government and to have a salary. That meant that botanists in India were less independent, but they did not face the same dilemmas as professional scientists in Britain. Botanists like Sir William Hooker, and his son Joseph, had to negotiate a complex path: until the mid nineteenth century much scientific work was done by rich amateurs.⁴⁷ The challenge for those without sufficient private means was to justify payment from the public purse whilst still retaining credibility in gentlemanly circles as truthful and unbiased observers.⁴⁸

Whatever their status, it was almost inevitable that nineteenth-century European botanists in India were to some extent part of a wider imperial project. Richard Drayton has suggested that imperialism can be characterised as a campaign to extend an ecological regime premised on the virtues of sedentary agriculture, private property, production for exchange and manufacture.⁴⁹ An oft-cited example is forestry, where indigenous sustainable management of forest resources was replaced by colonial exploitation of timber at the expense of the local way of life.⁵⁰ There is little doubt that Drayton is correct when he goes on to suggest that in developing their gardens botanists were deeply involved in this aspect of empire, and that imperial expansion allowed them to investigate new areas where they enthusiastically

⁴⁵ e.g. in Jon E. Wilson, *The Domination of Strangers: Modern Governance in Eastern India 1780-1835*, (Basingstoke, 2008).

⁴⁶ See Ray Desmond, *Kew: the history of the Royal Botanic Gardens* (London, 1995), for details of how Kew reached its present size.

⁴⁷ Sir James Edward Smith (1759-1828) and George Bentham (1800-84) are two examples of important British botanists who did not need to seek a salary.

⁴⁸ See Endersby, *Imperial Nature* pp. 20-28.

⁴⁹ Drayton, *Nature's Government*, 229.

⁵⁰ Vandana Shiva, *Staying Alive: Women, Ecology and Development* (London, 1989).

collected. From that point of view, science is, as he suggests, ‘inherently expansive in its universal appetites.’⁵¹

Examining the behaviour of the superintendents in more detail provides further evidence of their complex relationship with empire. Their social networks involved many other imperial administrators. Some, such as Falconer and Anderson, came from imperial service families and had relatives working in India. The superintendents could also be patronising and, in a sense, intellectually imperialist in their dealings with educated Indians. Thomson, for example, argued that the Botanic Garden could be a “civilising” influence:

... no means appear better adapted to produce that gradual modification of the modes of thought of the people of India which alone can bring about their amalgamation with European civilisation than the cultivation of the Natural Sciences and the education of the taste for the beauties of nature.⁵²

King was similarly paternalist in his comments on how the introduction of cinchona had benefitted the Indian population (see Chapter Five). Wallich also provided clear evidence of wanting to modify Indian behaviour to conform to western norms in his evidence to Parliament.⁵³ Their work at the Medical College, and their support for the Agri-Horticultural Society, showed the superintendents attempting to influence Indian minds by passing on western scientific knowledge. Their eager involvement with the work of the Plantations Committees and the introduction of tea growing between 1823 and 1855 showed a similar enthusiasm to pursue imperial aims. The superintendents believed that European science had a universal claim to truth. They based their authority on their technical knowledge and understanding of scientific processes. That gave them a sense of superiority – not only over differently educated Indians, but also over many British civil servants.

The superintendents wanted to survey as many areas as possible, so they valued the security provided by the expanding frontiers of the empire. They were glad to be able to collect in the wake of British armies, as Wallich did in Nepal and Burma. They also expected imperial support at times: Hooker was disappointed at the limited

⁵¹ Drayton, *Nature's Government*, 59.

⁵² Report on the Honorable (*sic*) Company's Botanic Garden, September 1856, para. 27.

⁵³ Report of the Parliamentary Select Committee on the Affairs of the East India Company: Evidence II, 13th Aug 1832.

response of the authorities in Calcutta when the Raja of Sikkim imprisoned him and Campbell in 1849, and Thomson light-heartedly suggested that Lord Canning should occupy Sikkim in 1856.⁵⁴ Sometimes their involvement was more direct: before they worked at the Botanic Garden Griffith and Thomson both took part in the invasion of Afghanistan in 1839-42, and Anderson was involved in the restoration of British power in 1857-58. Later on, George King admitted taking advantage of punitive columns in order to get collectors into remote areas.⁵⁵ King and his successors were also proud of their military ranks, and both he and Hooker were pleased to receive Indian order knighthoods.

Even so, botanists (and other scientists) cannot simply be placed in the same frame as all the other imperial administrators. Raji Ravan interprets Richard Grove as suggesting that, 'scientific communities were distinctive entities in colonial society, and science was not a passive tool of empire ...'⁵⁶ The ultimate commitment of colonial scientists was to the worldwide botanical project, and their membership of a global intellectual network distinguished them from those military and civilian officers whose careers depended more directly on the maintenance and expansion of British rule. Advancing British control and resources were very helpful to the botanists, but their involvement in the imperial project was limited, and their commitment was qualified. The superintendents' correspondence has hardly any references to the virtues of maintaining or extending British power,⁵⁷ and there is a continuing critical undertone, from Anderson's attack on the Governor General, Sir John Lawrence, for his lack of appreciation of the value of science,⁵⁸ to King's (and Clarke's) frustration with the indifference of the bureaucracy when trying to set up the Botanical Survey.⁵⁹

In one sense another British group that had a detached relationship with imperialism – the missionaries – provides a useful comparator. Scientists were not as distant from the imperial enterprise as some missionaries were,⁶⁰ but they had loyalties to a belief

⁵⁴ RBG Kew DC 55: Thomson to Sir William Hooker, 24th October 1856.

⁵⁵ RBG Kew DC 158: Sir George King to Sir Thomas Holderness, India Office, 10th August 1907.

⁵⁶ Ravi Rajan, *Modernising Nature: Forestry and Imperial Eco-Development 1800-1950* (Oxford, 2006), 4.

⁵⁷ The exception is Gage's comments to Prain in RBG Kew DC 158: November 1909 (see Chapter Four).

⁵⁸ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 22nd February 1865.

⁵⁹ RBG Kew MR 107: Note 51 by C B Clarke, 29th March 1890.

⁶⁰ Andrew Porter, *Religion Versus Empire? 1700-1914* (Manchester, 2004), 323.

system that made universal claims, and whose concerns were global rather than just imperial. Like missionaries, colonial scientists wanted to mould Indian minds and get them to accept western tenets, although, as with religion,⁶¹ Indians often appropriated and adapted those tenets as it suited them.⁶² Comparisons with missionaries should not of course be taken too far: the colonial régime was less suspicious of scientists, who were not seen as a potential source of instability in the way that missionaries were.

To Indians without formal education, scientists probably appeared no different to all the other British in Calcutta. To them, after all, the Garden was simply “Kompani Bagh,” the East India Company’s Garden. But on the occasions when the scientists showed themselves open to communication (in the Medical College and elsewhere) they were viewed differently by educated Indians. Even in their condescending way, their ability to convey valuable knowledge and provide access to global intellectual networks made scientifically qualified officers something more than remote imperial functionaries.⁶³

The relationship with the imperial government varied over time. In the first half of the nineteenth century the superintendents’ specialist knowledge gave them credibility, and saved them from detailed supervision. The patronage relationships between officials and botanists also changed gradually from depending simply on associations between people, to being about support for an institution and its outputs. Until 1858 the Botanic Garden reported to the Governor General in Calcutta, although ultimate power lay with the Directors of the East India Company in London. Importantly, the Directors (and later the Government of India) reserved the right to appoint the Superintendent.⁶⁴ After 1860, however, governance, and consequently science, became more complicated. The Botanic Garden became the responsibility of the provincial Government of Bengal, and Kew began to take a close interest in how botany was conducted in India, as part of its attempt to coordinate botanical work throughout the Empire. As a result there was sometimes a

⁶¹ Ibid., 317.

⁶² See Arnold, *Science, Technology and Medicine*, 164-167, for examples.

⁶³ CNH Kolkata Wallich Correspondence: letter from his medical students to Wallich, 7th April 1842.

⁶⁴ West Bengal State Archives: Proceedings, General Department, Section 46, October 1871. A. O. Hume to Government of Bengal, 31st July 1871.

three-way struggle for control between the Government of India, the Government of Bengal, and Kew. That demanded greater energy and attention from the superintendent, particularly during the very complex and drawn out negotiations that led to the setting up of the Botanical Survey of India in 1890.

Lastly, the thesis considers the British lack of ease in India. Many recent writers have focussed on the mixture of confidence and vulnerability that characterised colonial régimes.⁶⁵ Behind the confident voice of the scientists who ran the Garden, anxiety can often be discerned. The thesis therefore considers whether the presence of the Garden in Calcutta, and its moulding of the environment, contributed to British feelings of power and confidence in India. It seeks to find out how often that was a factor, implicit or explicit, in ensuring that the Garden received the resources it needed.

Scientific practice did not of course remain static, and there were important changes in the nineteenth century. Richard Yeo has noted how the early Victorian period witnessed something of a 'second scientific revolution', with attempts to reform the Royal Society linked to the demise of the general category of natural philosophy, and the rise of specialist disciplines. He identified a further major change in the 1860s when advocates of scientific naturalism rejected the legitimation provided by natural theology and pushed for professional careers and greater financial support from the State.⁶⁶ The thesis shows that there were echoes of both these developments in the story of the Botanic Garden. From the 1890s science and technology were underpinning more and more aspects of life – communications, health, defence and agriculture – and European governments competed to take advantage of them. As a result the specialist scientist became a more and more powerful and influential figure. In India, science was influenced by other factors too, with the accelerating application of technology and the penetration of western languages and education. As communications speeded up at the end of the century scientists in India (both British and Indian) were communicating with scientists in Britain in ways that were entirely different from those that prevailed at the beginning.

⁶⁵ For instance Cooper and Stoler (eds.) in their introduction to *Tensions of Empire* and Wilson, *The Domination of Strangers*.

⁶⁶ Richard Yeo, *Science in the Public Sphere: Natural Knowledge in British Culture, 1800-1860* (Aldershot, 2001), ix.

The structure of the thesis

The first of the six chapters that follow develops themes in this introduction and situates the Botanic Garden in its physical and historical spaces. It examines how the superintendents networked with officials, and with other botanists, in order to achieve their objectives. It considers how the Garden's connections with the rest of India, with the British 'metropolis', and with the global network, changed over time. It also considers the Garden's role in local intellectual networks, its willingness to incorporate local resources and knowledge, and its role in raising awareness of global environmental issues.

Chapter Two provides background material on the development of European interest in the flora of South Asia, the reasons for establishing Calcutta Botanic Garden 1786, and its progress under the first three superintendents. There are then two longer chapters, recounting the history of the Garden during the periods 1833 to 1871, and 1871 to 1914. They examine its botanical and scientific practices, and its achievements, and show what differing strategies the superintendents used to promote the interests of the Garden.

Chapter Five turns from scientific to economic botany, and considers the various ways in which the Garden responded to government pressures to support the introduction of useful crops, how successful it was in facilitating crop transfers, and especially its role in the introduction of tea and cinchona. It examines how the Garden used its successes to obtain resources, and looks at the relationship with the Agri-Horticultural Society, as well as the role of the Garden in promoting horticulture in India.

Chapter Six builds on the analysis of space and place in Chapter One and examines the physical aspects of the Garden. It shows how the moulding of its landscape came to reflect British imperial attitudes and policies, as well as the different scientific priorities of successive superintendents. It also looks at the significance of the on-going struggle to make the site fertile, and secure it against river erosion, cyclones

and intruders. The thesis then ends with a short conclusion summarising the findings emerging from the study.

Sources

There are many materials available for studying the history of the Botanic Garden. From the beginning, the Garden attracted the interest of senior officials, so there are a lot of references to it in the copious correspondence of the East India Company held at the British Library. After the Company's demise the superintendents regularly wrote annual reports on the Garden, in a more or less standardised format, and with increasingly detailed statistics. In addition, the records contain a good deal of the instruction and guidance sent to the Garden by the Governments of Bengal and India. These sources do, however, have to be used with caution. The Annual Reports were presentational documents; their aim was to highlight achievements and justify managerial decisions. Phrased in the right way they could attract approval and extra resources from the Government of Bengal. Sometimes the Government of Bengal issued an official Resolution in response to the Annual Report, and set out its views on what needed to be done. These resolutions provide useful insights into official thinking about the purpose of the Garden at the time. The later superintendents also had close and friendly relations with the successive Directors at Kew. They corresponded regularly, and felt free to express their private views. It is very useful to be able to cross check the views expressed in the Annual Reports with what the superintendents were saying to their colleagues at Kew. However, even in this more informal correspondence, the superintendents were anxious to present themselves as competent and hard working.

In addition to the sources at the British Library and the Royal Botanic Gardens, Kew, the thesis breaks new ground by drawing on the archives of Calcutta Botanic Garden itself, particularly the many volumes of letters written to Wallich whilst he was superintendent. There was also much useful information in the printed collections of the Asiatic Society, the records of the Agri-Horticultural Society and the West Bengal State Archives in Kolkata, and the National Archives in Delhi. In Britain, there was valuable additional material at the Royal Society and the Royal Asiatic Society in London, and at the Royal Botanic Gardens, Edinburgh. Apart from

the primary sources, there is an extensive secondary literature on the Garden. The first accounts of the Garden's early days were written over a hundred years ago.⁶⁷ Since then historians have examined many issues relating to colonial botanic gardens,⁶⁸ as well as producing a wider literature on India and the role of colonial science.⁶⁹ A few Ph. D. theses make reference to Calcutta Botanic Garden, and this study has been able to build on the work of Abhijit Mukherjee, whose 'Natural Science in a Colonial Context: the Calcutta Botanic Garden and the Agri-Horticultural Society of India, 1787-1870.' There have been several accounts of the history of botany in India, often written by botanists, or from the viewpoint of the major British botanic gardens.⁷⁰ In addition, recent researchers have produced some very useful articles and chapters on particular aspects of the Garden.⁷¹

This thesis, however, is one of the first attempts to look at the history of a colonial botanic garden *in toto*, and particularly to examine its relations with Government in detail, as well as considering the social and cultural aspects of its work. Whilst the corpus of work on the history of colonial science over the past twenty years provides a good guide, much of it is written from a general or theoretical standpoint. The original contribution of this thesis is to look at some of the same issues, using the actual evidence from a specific institution. The large and well-organised archive⁷² left by Wallich is particularly important, but we should note that the careful sorting of the letters to him (often interleaved with copies of his own replies) suggests that he had an eye to posterity, so the correspondence has to be read critically. The meticulously recorded correspondence between the Garden and Kew in the later nineteenth century has also been a very valuable source. Although it covers only eighty years, the thesis demonstrates how a full-length institutional history could be

⁶⁷ Sir George King, 'A Sketch of the History of Indian Botany', *Nature* 60, 12 & 19 October 1899.

⁶⁸ For example, Brockway, *Science and Colonial Expansion*, Donal P. McCracken, *Gardens of Empire* (Leicester, 1997) and Drayton, *Nature's Government*.

⁶⁹ Arnold, *Science, Technology and Medicine*, but also Deepak Kumar, *Science and the Raj, 1857-1905* (Delhi, 1995), Satpal Sangwan, *Science, Technology and Colonisation* (Delhi, 1991) and Pratik Chakrabarti, *Western Science in Modern India* (New Delhi, 2004).

⁷⁰ For example, Burkill, *Chapters on the History of Botany* and Desmond, *The European Discovery of the Indian Flora*.

⁷¹ Richard Axelby, 'Calcutta Botanic Garden and the Colonial Re-ordering of the Indian Environment', *Archives of Natural History*, 2008 and Mark Harrison, 'The Calcutta Botanic Garden and the Wider World, 1817-46' in Uma Das Gupta & D.P. Chattopadhyaya (eds.) *Science and Modern India: an Institutional History, c.1784 - 1947*, (Pearson, 2011).

⁷² Wallich organized and indexed his letters after he returned to Britain in 1846. They are bound into 27 volumes (plus a two volume index) and are held at the Central National Herbarium located at the A J C Bose Indian Botanic Garden in Kolkata.

written, focussing particularly on the actual practice of colonial botanists, and on periods of crisis and uncertainty when the future of the Botanic Garden was in doubt. There is much scope for further work in this field, and some of the possibilities are outlined in the Conclusion.

There are problems, though, in interpreting this archive and relying too much on written sources and visual evidence (such as maps). Most of the views and experiences recorded are those of well-educated European men in the imperial service,⁷³ so many letters and reports in the archives tend to create an illusion of colonial control and organisation by an all-seeing, all-knowing superintendent. There were, in reality, many others involved in running and observing the Garden – artists, clerks, plant collectors, overseers and labourers. The information we have on their contribution is largely filtered by superintendents such as Wallich, Griffith and King but it is salutary to remember that the Garden still functioned even when the superintendent was away for a long period – Wallich, for instance, was absent for five years from 1828 to 1833. During such absences Indian administrative staff at the Garden wrote occasional letters but there are too few in the archive to form a balanced view of the significance of their work. After the 1870s, however, we do hear the voices of Indians who trained at Calcutta Medical College (see Chapter One), and it gradually becomes possible to form a more balanced view.

⁷³ Occasional Indian voices are heard throughout. A few European women also played a role as collectors and recorders of botanical achievements, and had their views and reactions recorded: for instance, Maria Graham, who wrote a valuable account of the Garden in her *Journal of a Residence in India* (Edinburgh, 1812), and Rachel Voigt, who prepared her husband's *Hortus Suburbanus Calcuttensis* (Calcutta, 1845) for printing after he died.

Chapter One

Situating Calcutta Botanic Garden

This chapter is about space, place and the networks that Calcutta Botanic Garden participated in. It situates the Garden in the various physical, social and historical spaces it occupied, and considers what made it distinctive. It then examines how the networks that the Garden developed with scientists, administrators and local people in India, the Indian Ocean arena, and worldwide, operated. These networks were vital in enabling the Garden to mobilise the resources needed for India to contribute to the nineteenth-century global botanical cataloguing project, and to establish itself as a site of innovation and a ‘centre of calculation’.

No study of a scientific institution can ignore the insights that historians have acquired from geographers and sociologists, and the ideas about space and place that they have developed over the past fifty years. The ‘spatial turn in history,’ has provided valuable tools to examine the historical use of space, and has led to wide agreement that science, ‘is not just a collection of abstract theories and general truths but a concrete practice with spatial dimensions.’¹ The associated concepts of place, and the way in which places relate to each other, have allowed historians to re-examine the role of networks. This chapter will consider how such thinking can be applied to Calcutta Botanic Garden. That will include describing the space occupied by the Garden, and examining how it was constituted as a place. The main part of the chapter will then analyse the networks that the Garden formed and participated in, and how they resulted from the conjunction of place and time. It will also consider how scientific and environmental knowledge was received from and transmitted to botanists and others via networks in India, the Indian Ocean world, Europe and elsewhere.

¹ Nicolaas Rupke, ‘Afterword’ in Livingstone and Withers, *Geographies of Nineteenth Century Science* (Chicago, 2011), 439.

Reflecting on ‘the spatial turn’, Nicolaas Rupke has noted that over recent decades there has been a project to, ‘locate past scientific knowledge in the spaces of its production and circulation so as to ascertain the role played by local context.’² But there is a need to think further about space: it is not ‘mere geographical extent, a surrogate for territory or landscape.’³ Henri Lefebvre, one of the first writers to reflect on these concepts, argued that, ‘... spaces are produced, and are themselves productive of different social and material relationships.’⁴ Subsequent thinkers have built on Lefebvre’s insight that space is socially produced, particularly by using the concept of place, which is implied by Lefebvre’s spatial practice even though he himself does not use the term.⁵ John Agnew has suggested that space should now be seen as one-dimensional and only referring to a physical location.⁶ It is an abstract and conceptual idea primarily experienced through the mind.⁷ When we try to answer questions such as, “How much space did the Garden have?” we are considering a relatively objective issue, but the questions asked about place (“Did they find a good place for the Garden?” or “What sort of place was it?”) inevitably bring in associations and subjective judgements.

Clearly concepts of place and space are closely related. Robert Sack argues that places are ‘invariably parts of spaces and spaces provide the resources and the frames of reference in which places are made.’⁸ Place can be seen as having a richer meaning than space:

... multi-layered and subjective. It is created when the physical attributes, emotional connections, and psychological perceptions are combined to impart individual meaning and value. Therefore, a single space can be the setting for a multitude of different places depending on how it is used, read and perceived.⁹

² Rupke, ‘Afterword’ in Withers and Livingstone, *Geographies of Nineteenth Century Science*, 439.

³ Withers and Livingstone, *Geographies of Nineteenth Century Science*, 2.

⁴ Ibid.

⁵ John Agnew, ‘Space and Place’ in J. Agnew and D. Livingstone (eds.) *Handbook of Geographical Knowledge*. (London, 2011), 8.

⁶ Ibid., 18.

⁷ Andrew Schroeder, *Space and Place*, 1 (www.andrewschroeder.net, accessed on 4th December 2015).

⁸ Robert Sack, *Homo Geographicus*, (Baltimore, 1997), 16, quoted in Agnew, *Space and Place*, 19.

⁹ www.placepartners.com.au/blog/space-vs-place-defining-difference, accessed on 18th November 2015.

However, it has proved difficult to make a clear distinction between space and place. Alan Lester shows how Doreen Massey advocates a more relative conception, where the distinction between space and place becomes blurred, and suggests that, 'Specific places are seen as emergent from the very same mobilities and relations that constitute space in general.'¹⁰

Doreen Massey herself argues elsewhere that a sense of place is something that is formed by many outside influences, and constantly changes. She suggests that it is both space and time that come together in place, and therefore 'a particular place not only brings together local and global influences, multiple cultures and identities, but it also contains historical influences which shape its present, as do its plans and potential for the future.'¹¹ She suggests that instead of thinking of places as bounded areas, they can:

... be imagined as articulated moments in networks of social relations and understandings, but where a large proportion of those relations, experiences and understandings are constructed on a far larger scale than what we happen to define for that moment as the place itself, whether that be a street, or a region or even a continent.¹²

This in turn, Massey argues, 'allows a sense of place which is extroverted, which includes a consciousness of its links with the wider world, which integrates in a positive way the global and the local.'¹³

The coming together of space and time is obviously important for historians. John Agnew reinforces Massey's view when he argues that:

... places are not bounded, isolated entities as conventional regional studies have tended to regard them. Rather, they are usually and perhaps increasingly in a globalizing world, located in a series of extensive economic, political, and cultural *networks* with varying geographical scope. They are best thought of relationally.¹⁴

By associating networks with place, Massey and Agnew brings together space, place and networks, and this chapter will examine how these ideas can help in situating the

¹⁰ Alan Lester, 'Spatial concepts and the historical geographies of British colonialism' in Andrew S. Thompson, (ed.), *Writing Imperial Histories* (Manchester, 2013), 125.

¹¹ Massey, Doreen. 1995. 'The conceptualization of place' in *A place in the world? Places, cultures and globalization* (Oxford, 1995), 53-54.

¹² Massey, Doreen, 'A Global Sense of Place' *Marxism Today* (38) 24-29 (1991), 28.

¹³ Ibid.

¹⁴ J. Agnew, 'Space and Place' in Agnew and Livingstone (eds.) *Handbook of Geographical Knowledge*, 23.

Botanic Garden. It will show that the Garden's site, location and networks were integral parts of a wider whole, thus making it possible to situate it within a space, to examine the accretions that made it a place, and to see how they helped to form its networks and determine its trajectory.

Conceptualising the Garden as a space and a place

*'Coming to terms with science's somewhere is as vital as surveying and explaining its sometime and its somebodies.'*¹⁵

The Botanic Garden's identity as a place constantly changed. For outsiders, the Garden was an offshoot of a widespread European movement to establish colonial botanic gardens. For the British in Calcutta, it was a place of experiment and investigation. It depended, however, on a large local labour force, for whom it was a place of work, and sometimes a place of coercion, but also, for some of its gardeners and artists, a place in which to deploy their creative instincts. The Garden was therefore the sum of many people's perceptions. In Alan Lester's words, 'We need to see invading settlers and imperial sojourners conjoining with indigenous peoples and immigrants from elsewhere to form new assemblages of people, organisms, materials, places and landscapes.'¹⁶ Perceptions also changed over time. In Britain in the 1830s the Garden would have seemed a remote place, but much less so in the 1890s. In the 1830s and 1840s its appearance was criticized, but by the 1890s it was seen as a beautiful place.

The space allotted to the Garden in 1787 was generous, and it can be argued that by enclosing 310 acres Robert Kyd had unwittingly introduced the concept of a large colonial scientific space. Most eighteenth century botanic gardens were small. John Hope (1725-86), who was Professor of Botany at the University of Edinburgh, provides an idea of what was regarded as a normal space then:

In Jamaica there are 2 Botanic Gardens which are very large, tho' in General when we speak of a Botanic Garden we mean only a few acres of ground in which as

¹⁵ Withers and Livingstone, *Geographies of Nineteenth Century Science*, 3

¹⁶ Lester, Alan, 'Spatial concepts and the historical geographies of British colonialism' in Thompson, Andrew S. (ed.), *Writing Imperial Histories* (Manchester, 2013), 137.

many plants as can be procured are placed, yet these two I was speaking of are very large, one of 50 acres, the other 70 ...¹⁷

Many botanic gardens were derived from modest physic gardens whose main function was to provide medicinal plants. They expanded as they received ever-larger collections of exotic plants, but even Kew only had eleven acres before 1840.

For many years Calcutta was probably the world's largest botanic garden, and the fact that the space was perceived as large illustrates Doreen Massey's point that space itself arouses feelings, so cannot be separated from place. The Garden's size gave the superintendents a broad canvas, but also meant that they had no comparable model on which to base their management.

As we shall see, Kyd's decision to use the name 'Botanic Garden'¹⁸ put it in a particular category. The term had not been used in India before and was important in creating a specific sense of place. Botany is the systematic study of plants. Calling a garden 'botanic' implies a scientific and interpretive enterprise: botanic gardens are not just public parks. But the word 'botanic' is linked to 'garden', which also has very strong associations. In the Christian tradition, the original human state of happiness and innocence was experienced in the Garden of Eden.¹⁹ Cicero's claim that, 'If you have a garden and a library, you have everything you need,'²⁰ is one of many that associate gardens with beauty, contentment and learning.

David Livingstone lists other features of botanic gardens that contributed to people's expectations of them:

Further, the garden's very existence has depended on its capacity to represent order over chaos, cultivation in opposition to wildness, art as opposed to nature. The boundary of the garden marked out a line between the rational and the irrational.²¹

¹⁷ Hope, 'Lectures in Botany', 1777-8, Lecture 2, quoted in Tim Robinson, *William Roxburgh: the Founding Father of Indian Botany*, (Chichester, 2008), 16.

¹⁸ BL IOR H/799, 10: Kyd's letter of 1st June, 1786 to the Governor General and Council.

¹⁹ Andrew Cunningham, 'The Culture of Gardens' in Jardine, Secord and Spary, *Cultures of Natural History* (Cambridge, 1996), 38.

²⁰ Cicero, Letter to Varro, in *Ad Familiares* IX, 4.

²¹ David Livingstone, *Putting Science in its Place*, 49.

These were however, ideal attributes that many botanic gardens struggled to acquire and retain. Calcutta has to be more carefully situated, both as a scientific space and as a botanic garden.

It was not the first scientific space in India: Roxburgh, who was to succeed Kyd, started running a small experimental garden in South India in the early 1780s,²² and there were observatories created by Indian rulers as well as the East India Company in the eighteenth century. In its first ten years, however, Calcutta Botanic Garden acquired institutional features that made it distinctive. By 1796 it had substantial buildings, a large skilled work force and a scientifically qualified superintendent. It had become capable of experimenting, and accumulating botanical knowledge. It was as well resourced as any other botanic garden of the time, including Kew, even though it lacked Kew's royal connections, or the prestigious links with universities, municipalities or learned societies that many gardens in Britain had. It was, however, highly reliant on the East India Company. As its major sponsor, the Company expected the Garden to bring order and demonstrate the benefits of British rule.

As we have noted, places are constituted by the combined actions and memories of all those living in them, but the superintendents were particularly important as they had a large measure of autonomy. Some of their actions were the same as those of botanists setting up botanical gardens in Europe – all gardens needed to develop extensive nurseries, for instance. There was, however, a colonial particularity about the Calcutta Garden. Its location in India made it distinctive in terms of its relationships and the experiences that it provided compared to gardens in Britain, the settler colonies and elsewhere in Asia. In contrast to Peradeniya and some of the later gardens in India it was not located on the site of a pre-colonial garden, but it did inherit some pre-colonial forms and practices such as the recruitment and deployment of a labour force and the availability of experienced gardeners, botanical artists and administrative staff.

The Calcutta Garden was also unusual in Asia in being adjacent to a major port that was also an important capital city and power centre. Other gardens such as Pamplémousses in Mauritius, Peradeniya, and Buitenzorg were located inland, in the

²² Robinson, *William Roxburgh*, 127-8.

hills behind their respective capitals. Consequently they were less visible to key government decision makers and funders, and it was more difficult for them to access international trading routes. At a time when it was easiest to make long journeys by sea, moving plants and other material to and from the coast was a slow and difficult process. Calcutta also had a much larger and richer hinterland. Even so, these other gardens did sometimes challenge Calcutta as the premier tropical garden. As communications improved Peradeniya benefitted more from its proximity to Colombo, whose port was something of an Indian Ocean crossroads, and Buitenzorg was well resourced, with able Dutch scientists who proved to be better equipped to carry out applied research than those at Calcutta.

Comparisons with other nineteenth-century botanic gardens that were outside Europe, such as those at Sydney and Melbourne, can also help to illustrate Calcutta's distinctiveness. There was regular contact with Melbourne, initially run by Ferdinand von Mueller, one of the most important botanists of the time. However, Australian gardens had rather different functions, focussing more on providing recreational facilities for their respective cities, and acclimatising crops for settlers' farms and gardens. Australian gardens also drew on different indigenous traditions, and had smaller work forces that were largely European.

The Calcutta Garden has occupied the same space since 1786, and its longevity has further added to its distinctiveness: its avenues, trees and monuments reflect much of the story of colonial botany. This longevity mattered: botany is a practical science which needs a long term institutional base to follow the growth of plants, to learn how to nurture exotics and to landscape the area effectively. As Richard Grove contended, 'Continuity provided by an institution countered short term tenures by colonial officials and expedited more rapid, large-scale and regular transfer of intellectual ideas, innovation and exchange.'²³ It took over thirty years, for instance, before it became evident that teak trees suitable for shipbuilding could not be grown in Calcutta.

²³Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860* (Cambridge, 1995), 332.

Calcutta's tropicality also distinguished it from gardens in Europe or the settler colonies. As David Arnold has shown, European views of the tropics were fluid.²⁴ The early idea that the tropics were lush and bountiful changed, so that by the 1860s, much of central and northern India 'failed to look like the imagined tropics.'²⁵ As a result, there was a colonial determination to create an "improved" and more fruitful landscape, one that was more genuinely "tropical" and attractive.²⁶ That demonstrated the sense of entitlement of political and cultural élites, such as the British rulers of India, to pre-empt and alter the space they controlled.²⁷ The low-lying tropics also came to be seen increasingly as a site of disease and corruption, a view well summed up by Andrew Gage, rejoicing at his arrival in the hills of Sikkim: '... I had been having liver congestion and fever again. Now I am very much better however, and enjoying the change from the vile sodden stinking atmosphere of Sibpur to this glorious air.'²⁸ Calcutta differed from its counterparts in Europe in being perceived as a place where the external environment was dangerous as well. Kew's gardeners never had to cope with cyclones, earthquakes or attacks by wild animals. In reality the Calcutta Garden was normally a peaceful and orderly place, but there were enough unwelcome occurrences to make it seem threatening and unknowable, as India ultimately was for many British in the nineteenth century.

The place of the Garden in the networks it contributed to

As we have noted, places can be located 'in a series of extensive economic, political, and cultural *networks* with varying geographical scope'²⁹ and imagined 'as articulated moments in networks of social relations and understandings.'³⁰ Bearing in mind this idea that place is where time and networks come together, we can see that the Garden's changing sense of place determined the role it played in networks, whilst the changing nature of colonial and scientific networks influenced the sort of place

²⁴ Arnold, *The Tropics and the Travelling Gaze*, Conclusion.

²⁵ Ibid.

²⁶ Ibid., 227.

²⁷ Henri Lefebvre, *The Production of Space* (1991), 33, and David Harvey, *Spaces of Capital: towards a Critical Geography* (London, 2001), quoted by Katrina Navickas (<http://historytoday-navickas.blogspot.co.uk/2011/09/spatial-theory-cultural-geography-and.html>, accessed on 19 September 2014).

²⁸ RBG Kew DC 158: Gage to Prain, 18th September 1907.

²⁹ Agnew, 'Space and Place', 23.

³⁰ Massey, Doreen, 'A Global Sense of Place,' 28.

that the Garden was. The focus therefore shifts now from how the Garden was constructed as a distinctive place, to examine the social space that it occupied, and its importance as a dynamic contributor to various networks.

There were many types of colonial networks in the nineteenth century. Some were based on shared experience, such as those of Peninsular War veterans. Involvement with a particular cause could also be important, an example being the network of humanitarian campaigners (who were often evangelical Christians as well).³¹ Here we shall focus on the similar, but more open, networks of European scientists based on the shared intellectual interests of those based overseas and in the colonies.³² Scientists, like other Victorian professionals, needed a network of contacts to inform and sustain them. Their use of networks is therefore a useful prism through which to examine how they achieved their objectives.

Participation in a network could be initiated as the result of an introduction or casual acquaintance, but strong bonds often developed subsequently. Networks of scientists in the nineteenth century tended to be characterised by symmetric relations between equals, even though there were inevitably some asymmetric or subordinate interactions.³³ Membership of a network was conditional, and conveyed expectations. Networks developed a whole series of conventions, about how frequent contact should be, what level of expertise was required, what language should be used in letters, and how regular the exchange of material and pictures should be. The network of botanists was notably active and was accessible to outsiders like Wallich, originally from Denmark. Its international focus meant that it always involved participants who were not British or part of the British Empire. It was preferable to reinforce participation by a personal appearance in the metropolis, such as Wallich's four-year sojourn in London from 1828 to 1832.³⁴ The leading botanists in Britain were often dependent on a flow of specimens from different locations and climates.

³¹ Zoë Laidlaw, *Colonial Connections 1815-45: patronage, the information revolution and colonial government* (Manchester, 2005), 21-32.

³² Ibid.

³³ Ibid., 13.

³⁴ Ibid., 16.

In return they would send the latest books and news, and sometimes helped with publishing new finds.³⁵

Networking was central to the Garden's scientific and economic projects, and significant for the exchange of ideas about landscaping and nursery work. By examining the totality of these networks we can learn much about what the superintendents' main identities and loyalties were, and how centre-periphery relations influenced the way in which colonial knowledge was formed and diffused. It also allows us to consider the central coordinating role of Kew, and how the Calcutta Garden managed its relations with government officials, in India and in Britain. Finally, it is an opportunity to assess the extent to which local communities helped to form European knowledge, and how far that knowledge was shared with them.

One of the distinctive features of the Calcutta Garden was its geographical scope. From its base in the Bengal Presidency it aspired to investigate the flora of an area stretching from Afghanistan to Singapore, and it also expected to be the main point of reference for the whole of the Indian Empire, even though there came to be other, largely independent, botanic gardens in India. The Garden's physical location close to a major port played an important role in determining the networks within which it functioned. In its early days, for instance, Singapore was closer in terms of sailing time than Bombay. Encouragement from Sir Joseph Banks, combined with the active approach of the superintendents and their plant collectors, meant that the Garden was able to form strong relationships from the start. It contributed to the construction of networks and did not merely participate in them. Whilst some superintendents may have identified themselves initially as representatives of metropolitan science, their long service in India often meant that they came to take a more Indo-centric position.

It is important to understand how superintendents mobilised networks to forward their scientific projects and to engage with people in power, and how the operation of the networks changed over time. In Britain, there were numerous botanists, and they were able to associate with each other quite easily. That was not the case in India until the later nineteenth century, and life for scientists could be lonely. Even in

³⁵ Endersby, *Imperial Nature*, 3.

Calcutta there were not many people with serious scientific interests, so botanists there made a lot of effort to seek out the few people who were interested in plants, and often developed close relationships with them. The superintendents networked with several organisations in Calcutta, with their colleagues in other parts of India, and sometimes with interested local people.

Whilst the superintendents were the leading participants in the Garden's external networks, many others helped to constitute it as a place, and therefore as a node in its networks. By the late nineteenth century the Garden was employing well-qualified herbarium and garden curators who were actively involved. The Garden also employed English-speaking Indian clerks from its early days to deal with payments, labour issues, employment of contractors, catalogues and the despatch of seeds and plants, and they played an important administrative role making sure that the networks functioned.³⁶

This wider participation was one of the things that gave Calcutta a strong identity within its networks. Because of its size India had a very special status within the British Empire.³⁷ The Government of India expected its European officers to spend their entire career in the sub-continent, but then to return to Britain. That was in contrast to other constituent parts of the Empire. British people going to the nineteenth-century settler colonies increasingly stayed there, and by the end of the century many officials were recruited locally. Those who worked in colonies controlled by the Colonial Office, however, often had careers involving postings to several different territories.

There were some exceptions to these patterns. Whilst senior British officials in India almost invariably spent their whole careers there, some junior or technical staff did move elsewhere in the Empire. That did not apply to botanists, however, and there are only three instances of botanically qualified people moving to or from other colonies. The first was the Herbarium Curator at the Calcutta Garden, Sulpiz Kurz, who moved from Buitenzorg in 1865. The others were L. J. K. Brace, who moved to

³⁶ See for instance RBG Kew DC 155: Colly Coomar Mookerjee to Joseph Hooker, 20th June 1862.

³⁷ Metcalf, Thomas, *Imperial Connections: India in the Indian Ocean Arena* (London, 2008), Introduction.

Calcutta from the Bahamas (see Chapter Four) and I. H. Burkill, who left the Department of Economic Products in Calcutta in 1912 to become Director of the Singapore Botanic Gardens.

All networks link places, but they vary in form. Some can be visualised as a simple net, with each connection having the same status, and the same potential links. At the other extreme is the hub and spoke model, where messages and material travel from one central point, but the recipients do not have any direct connection with each other. In the real world, however, the situation is invariably more complicated, with some participants having greater status and acting as a central point for others, so the spider's web is a better analogy. Looking at the networks that Nathaniel Wallich participated in, Mark Harrison not only showed how important scientists' loyalties to the international scholarly community were, but stressed that in the 1830s colonial science functioned as a web, or 'polycentric communications network' rather than a spoked wheel.³⁸ In other words there can at times be several subsidiary webs stretching through space, rather than one that dominates.

So far we have conceptualised networks as functioning horizontally, but to understand them fully it is also necessary to introduce notions of scale and hierarchy. The scale of Calcutta Botanic Garden's networks went from the local (within Calcutta), to the India-wide, regional (the Indian Ocean) and intercontinental. As a place and a participant in international networks, the Calcutta Garden always had a complex identity. It generally aspired to a wide remit as a regional node in the Indian Ocean world. And whilst it did not have any formal authority over the other botanic gardens in India until the end of the nineteenth century, it expected to conduct India's relations with botanic gardens elsewhere.³⁹

Networks are formed and constituted partly by the mobility of their participants. The earliest superintendents in Calcutta, Kyd and Roxburgh, were not great travellers but still believed that their responsibilities extended beyond India itself. Roxburgh regularly sent collectors to the Malay states and the Dutch East Indies. But the mobility of later superintendents was important in reinforcing the networks by direct

³⁸ Harrison, 'The Calcutta Botanic Garden and the Wider World', 247.

³⁹ RBG Kew Archives MR 225, Folios 21-25: *Memorial on Calcutta Botanic Garden* (1846?).

contact: Wallich, in particular, traced a network over much of the Indian Ocean. At different times he investigated the plant life of Mauritius, Nepal, Singapore, Burma and South Africa, and proudly included maps of his travels in his magnum opus, the *Plantae Asiaticae rariores*. Later superintendents travelled less than Wallich, but both Anderson and King visited Peradeniya and Buitenzorg, and King made himself an authority on the flora of the Malayan Peninsula. Their senior staff and collectors travelled more widely: Sulpiz Kurz spent long periods in Burma and wrote important works on the flora there, and David Prain collected extensively in the Andaman Islands, Assam and Burma.⁴⁰ All these travels were important in constituting the Botanic Garden as a place with wide responsibilities, thus reinforcing its status within its networks. In assuming these wider responsibilities the superintendents reflected the reach of the Indian Empire, which has been characterised by Thomas Metcalf as a ‘sub-imperial centre in its own right.’⁴¹ Metcalf’s case relies more on the size and strength of the Indian Army, India’s pools of surplus labour, and enterprising traders, but the feeling that India had useful models and resources to offer more recent British colonies was certainly reflected in the Garden’s assumption of a responsibility to catalogue the flora of a wider area.

Turning from scale to hierarchy, the Garden had other reasons for laying claim to high status. Compared to most botanic gardens outside Europe it was long established, close to the seat of Government and, by the end of the nineteenth century, could draw on a wide range of resources including a large herbarium, artists, clerks and an ability to publish. That contributed to its prestige as a place, and was reinforced by the fact that Joseph Hooker saw it as a key garden in the imperial network. As Britain’s leading botanist he corresponded regularly with each superintendent for nearly sixty years, and provided them with access to contacts at the highest level.

The correspondence of the superintendents is a key resource for understanding how hierarchy played a role their networks. Wallich’s correspondence, in particular, reveals a striking variety of contacts, and indicates how attractive a networking partner Calcutta was seen to be. By the end of Wallich’s time, Kew Gardens was

⁴⁰ RBG Kew MR 226: CBG Annual Report for 1890-91, para. 4.

⁴¹ Metcalf, *Imperial Connections*, 7.

beginning to assert itself as Britain's leading botanical institution, and to claim the right to coordinate imperial efforts. Colonial botanists accepted that claim, and its effect on their networking, as they were happy to see the status and prestige of their science raised, and to have an advocate for their profession at the centre of the Empire. Increasingly after 1850, the superintendents' correspondence was with Kew. The 'polycentric communications network' remained, but as in a spider's web, there was a clear centre.⁴²

The scientific networks were never static: their purpose and hierarchies changed continually between 1833 and 1914, as did their *modus operandi* and qualifications for membership. When Wallich was Superintendent, personal patronage and contacts with influential people were still very important. The milieu that King and Prain operated in was quite different. Patronage did not disappear entirely, and the superintendents still needed the confidence and backing of the Director at Kew in order to be influential members of the botanical network. Equally important, however, was the need to have a close understanding of the workings of a complex and impersonal system of official relationships in India.

As communications improved, relationships with other botanic gardens and practitioners became closer, but at the same time central institutions, like Kew, were able to exert greater control. The introduction of the overland route to India via Egypt after 1840, the opening of the Suez Canal in 1869, the inauguration of a direct telegraph link between India and Britain in 1870⁴³ and the rapid expansion of the railway system all had notable impacts.⁴⁴ The figures below give an idea of how communication between Britain and India speeded up:⁴⁵

1820	Sailing ship via the Cape	150 days (to Calcutta)
1840	Overland route (via Suez)	90 days
1850	Overland route	40 days (to Bombay)
1869	Suez Canal opened	20-25 days (to Calcutta)

⁴² Mark Harrison, 'The Calcutta Botanic Garden and the Wider World', 247.

⁴³ <http://atlantic-cable.com/CableCos/CandW/Eastern>, accessed on 22nd January 2015.

⁴⁴ In 1861 there were still only 1,587 miles of railway in India, but that had increased to 5,074 miles by 1871, and 9,723 by 1881 (Hurd, John & Kerr, Ian, *India's Railway History: A Research Handbook*, 145).

⁴⁵ Headrick, Daniel R., *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (New York, 1981), 129ff.

- 1870 (Overland telegraph connection to Britain 1-2 days)
 1900 Mail via Suez Canal and train from Bombay 16-21 days (to Calcutta)

These developments greatly eased the exchange of botanical information. Plants and seeds were much more likely to survive if they were only in transit for a few weeks, and herbarium specimens could be loaned routinely for research. Swifter postal services made correspondence more meaningful and efficient, and manuscripts could be sent quickly for checking and publication. Faster ships also enabled officers in India to go on leave to Britain regularly, and to visit Kew, so there was far more personal contact: between 1885 and 1894 King went to Britain six times.⁴⁶ Within India the new rail network allowed botanists to visit each other and exchange information, and to arrange all-India meetings more easily, and as we shall see in the next section, their similar identities made them eager to be in touch with each other.

The rest of this chapter will consider how Calcutta Botanic Garden helped to form the networks it participated in, and how it contributed to them as well as benefitting from them.

Calcutta Botanic Garden and scientific networks in India and the wider Indian Ocean world

The *Hortus Bengalensis*, Roxburgh's 1814 Catalogue of Plants growing in Calcutta Botanic Garden, included the names of the donors and suppliers. That gave Roxburgh's successors a ready-made list of people who were interested in botany. By creating a repository for previously unstudied plants, the Botanic Garden stimulated botanical collecting in India, and allowed the efforts of amateur botanists to be recognised. It also provided visitors to Calcutta with a destination where they could learn more about what grew in India. The existence of an institution dedicated to the study of plants thus led naturally to the formation of a network. These points are important in answering M'Clelland's 1841 query about what might have happened if there had been no Calcutta Garden.

⁴⁶ See paragraphs on staff movements in Calcutta Botanic Garden Annual Reports, 1884-85 to 1893-94.

Place and location naturally played a role in determining the institutions the Garden networked with. There were at least four organisations in Calcutta and its environs that helped to sustain, and were in turn sustained by, the early work of the Botanic Garden. Wallich was closely involved with all of them. The first was the Asiatic Society of Bengal, which had been founded in 1784. It was important as a venue where scientists and other scholars could exchange ideas and publish. Most of what Wallich did with the Society concerned the taxonomic project, rather than economic botany. The Society underwent a revival in the 1830s when James Prinsep was Secretary, and Wallich was a committee member.⁴⁷ Wallich also derived a lot of support from the Baptist missionaries, led by Dr William Carey,⁴⁸ at the nearby Danish colony of Serampore. Carey had helped to obtain the Superintendent post for Wallich in 1817, and was a knowledgeable botanist himself. Carey had established a small botanic garden at Serampore, and in the 1840s the Danish surgeon there, Dr J. O. Voigt, produced a valuable catalogue of plants.⁴⁹ One of Carey's many achievements was to found the Agri-Horticultural Society of India, the third of the Calcutta institutions that the Botanic Garden was closely associated with (see Chapter Five). Finally, there was the Medical College, founded in 1835. Wallich was appointed Professor of Botany there in 1837.⁵⁰ He developed good relations with the students, who became regular visitors to the Botanic Garden,⁵¹ and also became close to some of the professors.

Serampore ceased to be of much importance to Calcutta's intellectual life after the 1840s, but links with the other institutions continued. George King became president of the Agri-Horticultural Society in 1875,⁵² although it declined in importance after that as much of its work was taken over by the agricultural departments. Other

⁴⁷ James Prinsep (1799-1840) had wide interests in chemistry, mineralogy and numismatics, and edited the *Journal of the Asiatic Society of Bengal* in the 1830s. He became a Fellow of the Royal Society in 1828, and is commemorated by the recently restored Prinsep Ghat in Kolkata.

⁴⁸ William Carey (1761-1834) was a remarkable self-made man. He originally arrived in Bengal as Baptist missionary, but proved to be a brilliant linguist and oriental scholar. Wellesley appointed him a professor at Fort William College, and he was also important as a printer, publisher and educationist.

⁴⁹ Voigt, J O, *Hortus Suburbanus Calcuttensis: A Catalogue of the Plants which have been cultivated in the Hon. East India Company's Botanical Garden, Calcutta, and in the Serampore Botanical Garden* (Calcutta, 1845).

⁵⁰ Samita Sen and Anirban Das, 'A History of the Calcutta Medical College and Hospital,' in Uma Das Gupta & D.P. Chattopadhyaya (eds.), *Science and Modern India: an Institutional History, c.1784 - 1947* (Delhi, 2011), 487.

⁵¹ Central National Herbarium Archives, Kolkata (hereafter CNH Archives), Wallich Correspondence: Petition from Medical College students to Wallich, 7th April 1842.

⁵² Vijay Dudeja (ed.), *In Full Bloom (a history of the Agri-Horticultural Society of India)* (Calcutta, 1996), vi.

superintendents were less enthusiastic than Wallich about teaching at the Medical College, but it continued to be a source of useful connections until a full time professor of botany was appointed in 1907. The relationship between the Garden and the Asiatic Society continued until 1914, and indeed long after. George King and David Prain were both active members. When he returned to Britain and had to sever his connection with the Society, Prain described it as ‘...the Society I liked best and felt most at home in.’⁵³

Developing a wide network of contacts was one of the advantages of remaining in Calcutta for a long time, and could make it much easier to get things done. Thomson wrote a little enviously:

The garden was in fact indebted to the liberality of Captains of Ships and to the personal influence of the Superintendent for the conveyance of glazed cases, and as the long experience and extended acquaintance with Calcutta Society which Dr. Wallich possessed are no longer available, the free conveyance has almost ceased.⁵⁴

In the 1850s and 1860s Falconer, Thomson and Anderson had hardly any botanical colleagues in Calcutta, but King and his successors were more fortunate. In the 1880s and 1890s King had the company of David Cunningham,⁵⁵ George Watt, C. B. Clarke and later David Prain. The closeness of their relationship is well expressed in Cunningham’s dedication of a book:

To Sir Joseph Dalton Hooker, ... ; and to Sir George King and Lt-Colonel David Prain, whose friendship has ever been as trustworthy and helpful as it is now old, this volume is gratefully dedicated.⁵⁶

From the early nineteenth century there were botanic gardens in the other main regions of India (see Figure 5 below): the Superintendent in Calcutta was rarely the only botanist working for the East India Company or the Government of India, but he was always the best paid, with the largest garden, and closest to senior officials. However, the network of botanists in India reflected the peculiar circumstances of British rule in India, with its competing provinces and patchwork of directly

⁵³ RBG Kew BUR 1/1: Prain to Burkill, Dec 1907.

⁵⁴ BL IOR F/4/2695 No. 190938: Report on the Honorable Company’s Botanic Garden, 24th September 1856 para.8.

⁵⁵ Cunningham was Professor of Physiology at the Medical College.

⁵⁶ David Cunningham, *Plagues and Pleasures of Life in Bengal* (London, 1907), v.

administered areas and Indian states. The Superintendents had no actual power over botanists in the other Presidencies, and those Presidencies guarded their prerogatives jealously.

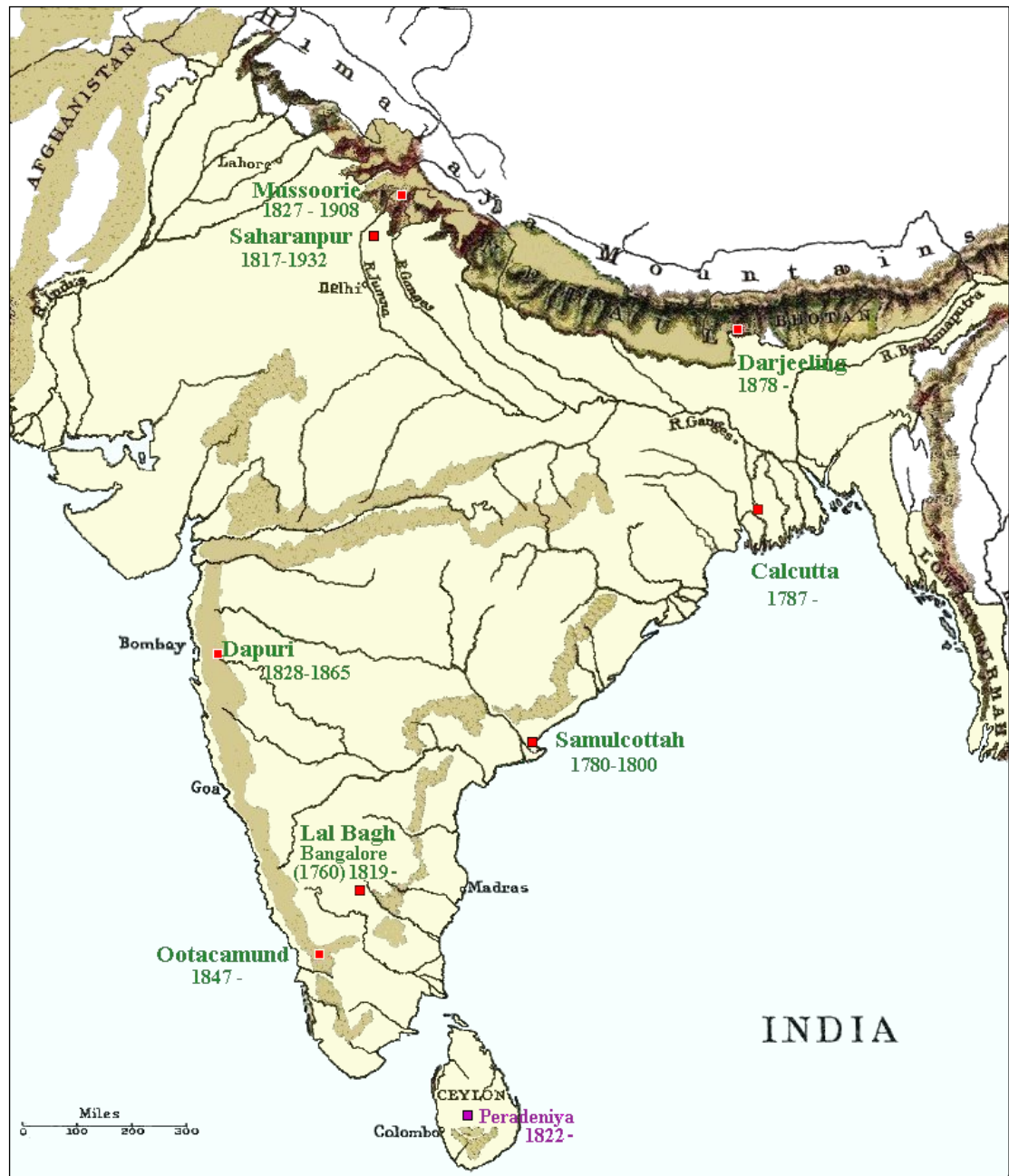


Fig. 5. A nineteenth-century map, with the location and dates of the Indian botanic gardens added and marked in green. Note that only Calcutta and the short-lived Samulcottah were on the coast; the other gardens were much more constrained in their access to maritime networks.

Nevertheless there was regular communication between botanists in India. Wallich maintained friendly relations with Robert Wight, the leading botanist in South India

between 1820 and 1850.⁵⁷ But Wight worked entirely independently on his research, which involved both taxonomic and economic botany, and did not seek Wallich's advice or approval when he published books. The situation in northwest India and the United Provinces was similar. Soon after he was appointed Superintendent at Saharanpur, the twenty-six year-old Hugh Falconer showed himself in awe of Wallich, who was almost twice his age. In a long letter, he wrote to say how much he had appreciated Wallich's treatment of him when they first met in Britain:

I had a simple introduction to you. The high rank that you held in Society – and as man of science - ... and the relation on which we stood in every way – would have led most men – if they had felt inclined to notice me – to have done so with the pride and condescension of patronage. But it was far otherwise with you.⁵⁸

This clearly shows the hierarchy in the Indian scientific network, but in spite of his subservient tone, Falconer was aware that he was quite independent of Calcutta. From 1834 to 1838 he wrote regularly to Wallich and told him a lot about what he was doing at Saharanpur, but he did not ask for instructions, or even guidance.⁵⁹ Expectations of what he should be doing came from the Lieutenant Governor of the North Western Provinces, or direct from the Governor General, and he soon started doing research of his own on geology and palaeontology.

The situation did not change much with Falconer's successors. Jameson, who ran Saharanpur from 1845-75, focussed on economic botany and on his routine duties of supplying seeds and plants to the civil and military establishments in his area, yet none of the superintendents in Calcutta tried to divert him into botanical investigations. Jameson's successor, Duthie, who was at Saharanpur from 1875-1903, was more of a taxonomic botanist and wrote important works on the flora of northern India. However, he tended to communicate direct with Kew, and King did not attempt to steer his efforts until the Botanical Survey was set up.⁶⁰

Even after 1890 King, Prain and Gage did not find it easy to establish their authority amongst the botanists. The Botanical Survey of India as first set up was a weak

⁵⁷ See Henry Noltie, Vol.1 – *The Life and Work of Robert Wight* (Edinburgh, 2007).

⁵⁸ CNH Kolkata Wallich Correspondence: Falconer to Wallich, 13th February 1835.

⁵⁹ See, for instance, CNH Kolkata Wallich Correspondence: Falconer to Wallich, 11th January 1838.

⁶⁰ Leonard Huxley, *Life and Letters of Sir Joseph Dalton Hooker Vol. II* (London, 1918), 281 ff.

institution. King was given the powers of a constitutional monarch to advise and warn, but could not determine policy or issue instructions to botanists in other parts of India. That illustrated the very real tensions of government in India, rather than any failing on King's part. In the north of India, and in Bombay and Madras, the provincial governments felt that they presided over different environments, and wanted to have policy determined by local experts rather than someone sitting in Calcutta. However the competition to report research in the *Bulletin of the Botanical Survey* encouraged all the provinces to send their botanists on botanical tours, and there was a flowering of botanical publication in the decade 1900 to 1910.⁶¹ Beyond India's borders, the superintendents in Calcutta maintained good relations with the directors at Peradeniya: there were regular exchanges of seeds and plants, and occasional visits.

The formation and communication of scientific and environmental knowledge through international networks

The superintendents not only had to create effective Indian and regional networks, but also to communicate scientifically and situate the Garden as a place within the global networks. From the start they transmitted data and material to Europe. In return they received a variety of information telling them what had been done elsewhere, because a development or discovery almost anywhere in the network was potentially relevant. As David Arnold has pointed out, seeds and plants became a sort of currency in which botanic gardens traded, and the size of a botanic garden's output was a major determinant of its prestige within the network.⁶²

Global networking brought the superintendents face to face with the issue of whether the Garden was a place where serious botanical work should be done, or whether it should be subordinate to, and dependent on, knowledge that diffused from a more learned metropolitan 'centre'. Writers on the history of science have put forward various diffusionist models over the last fifty years.⁶³ George Basalla proposed a number of phases during which expertise was transferred from the

⁶¹ The full range of publications is listed in Richard Axelby and Savithri Preetha Nair, *Science and the Changing Environment in India 1780-1920* (London 2010), 37-40.

⁶² Arnold, 'Plant Capitalism and Company Science,' 917-18.

⁶³ Deepak Kumar, *Science and the Raj*, 3-10, describes the development of these ideas since George Basalla first put forward his model in 1967.

metropolitan ‘centre’ to the colonial ‘periphery.’⁶⁴ Basalla’s ideas have been discussed and refined by several authors, including Michael Worboys⁶⁵, Roy Macleod⁶⁶ and Satpal Sangwan.⁶⁷ Roy Macleod in particular has dispelled the myth of the fixed, all-knowing metropolis and postulated instead a ‘moving metropolis’, itself influenced and changed by inputs from the empire.⁶⁸ Macleod’s view that influences were often two-way is now generally accepted, and was recently restated by John Mackenzie: ‘Moreover we have to think in terms of complex regional webs. Empires were never simply about the so-called centre and “periphery”: they can only be understood in terms of inter- and intra-colonial networks...’⁶⁹ Nicolaas Rupke similarly argues that nineteenth-century science has been convincingly shown to have, ‘constituted a plurality of knowledges, each shaped by local customs and norms, dependent on locally generated authority and credibility, and serving partisan political purposes.’⁷⁰

The science disciplines, including botany, that were shaped by the imperial experience therefore need to be looked at within a single analytic frame.⁷¹ Kapil Raj has demonstrated how important a part mutual agency played in practical scientific knowledge formation.⁷² His insights capture the actuality of knowledge formation in India, and the story of the Botanic Garden and its networks provides several examples to support them: the publishing work of the Garden would, for instance, have been much diminished without the input of Indian artists. Pratik Chakrabarti has gone on to argue that the liminal, peripheral experience of practising science in India produced critiques of the dominant centre by both Europeans and Indians, as well as providing new creative spaces for the development of diverse formulations

⁶⁴ George Basalla, ‘The Spread of Western Science’, *Science*, Vol 156, 5 May 1967, 611-22.

⁶⁵ Michael Worboys, ‘Science and the Colonial Empire’, in Deepak Kumar (ed.) *Science and Empire*, (Delhi 1991).

⁶⁶ Roy Macleod, ‘On Visiting the “Moving Metropolis”: reflections on the architecture of imperial science’, *Historical Records of Australian Science*, 5, 3, (1982).

⁶⁷ Satpal Sangwan, ‘From Gentlemen Amateurs to Professionals: Reassessing the Natural Science Tradition in Colonial India 1780-1840’ in Richard H. Grove et al. (eds.) *Nature and the Orient*, (Delhi, 1988), 210-236.

⁶⁸ Roy Macleod, ‘On Visiting the “Moving Metropolis.”’

⁶⁹ John Mackenzie, Foreword, xiv, to James Beattie, Edward Melillo, and Emily O’Gorman, *Eco-Cultural Networks and the British Empire* (London, 2015).

⁷⁰ Nicolaas Rupke, ‘Afterword’ in Livingstone and Withers, *Geographies of Nineteenth Century Science*, 441.

⁷¹ Frederick Cooper & Ann Laura Stoler, ‘Between Metropole and Colony: Rethinking a Research Agenda’ in Cooper & Stoler (eds.), *Tensions of Empire: colonial cultures in a bourgeois world* (Berkeley, 1997), 4.

⁷² Kapil Raj, *Relocating Modern Science* (London, 2010).

about nature, morality, history and spirituality.⁷³ These are instances rather than models though, and it is important to remember, as Ravi Rajan points out, that the level of creativity in colonial science varied over time.⁷⁴

The distinctive aspects of knowledge formation in India were partly a result of its size and complexity. Unlike some areas that came under European control in the nineteenth century, India had a tradition of large political units and a sophisticated material culture. In considering the impact of western science it can therefore only be compared with Asian and Islamic states such as China, Japan, Iran and the Ottoman Empire. But those states remained independent or semi-independent, so were able to respond more coherently. In this sense, the Indian case is almost unique, and cannot easily be fitted into any theoretical framework about the spread of European science.

It is similarly difficult to pigeonhole metropolitan and colonial scientists. Whilst scientists in India did correspond and form a loose network, there were neither the institutions nor the communication systems for them to meet and develop a specifically “Indian” science before the later nineteenth century. In practice there was in any case an overlap. Joseph Hooker himself spent three years in India, and some metropolitan scientists, such as Forbes Royle, had a substantial career in India but later practised influentially in Britain. Such people often ‘brought fresh life to the scientific societies of London and provincial England in the process.’⁷⁵ After he retired, Wallich was active in both the Royal and Linnean Societies, and Falconer in the Royal and Geological. Later on, Prain became Treasurer of the Royal Society and Gage worked for the Linnean Society. We must therefore be cautious about assigning categories to groups of scientists when there was in fact significant interpenetration.⁷⁶

Applying Bruno Latour’s argument that science advanced by means of ‘centres of calculation’ allows us further insights into the role of nodal institutions and the process of knowledge formation at the Garden. Latour suggests that each extra item

⁷³ Chakrabarti, *Western Science in Modern India*, 298.

⁷⁴ James Beattie, review of Ravi Rajan, *Modernising Nature* in *New Zealand Journal of Asian Studies* 10, 2 (December 2008), 111-120.

⁷⁵ Macleod, ‘Scientific Advice for British India,’ 348.

⁷⁶ Drayton, *Nature’s Government*, 171, points out that natural scientists were one of the groups of professionals importing extra-European concerns into the texture of metropolitan life.

of scientific information added to the ability of a coordinating centre to know, compare and process the flow.⁷⁷ He emphasises that what is accumulated needs to be mobile (so that it can be brought back to the metropolis), stable (so that it can be moved without decaying) and combinable (so that it can contribute to accumulation, be shuffled etc.).⁷⁸ The importance of this is that the accumulation of collections enables the ‘centre of calculation’ to become a particularly powerful node within its network, and may bring about a revolution in thinking. Such a model can easily be applied to botany, where a really large herbarium allowed new connections to be made, because no one had previously been able to compare so many plants.⁷⁹

There are, however, problems in applying this model to India. One limitation of Latour’s analysis is his Eurocentric assumption that centres will be in the ‘metropolis’. There is no reason why a ‘centre of calculation’ should not be in a large regional centre such as Calcutta. It only needed a steady flow of specimens to provide reference material for subsequent investigators, who could then build on earlier efforts, and thus contribute to the ‘cycles of accumulation’. Once the ‘centre’ had accumulated large amounts of information it became stronger, and ever more knowledgeable. The important point is that the power of a ‘centre’ required a strong and well-organised institution, and the way in which the Botanic Garden gradually asserted its role as the coordinating point for botanical investigations and research in India and the East Indies, will be a key issue throughout this study. Latour rightly stressed that botany could not be constructed everywhere in a universal and abstract space – it needed institutions and cataloguing systems.⁸⁰ However, Latour’s model does not give enough importance to networks. The complex relationships between the Botanic Garden and the individuals and organisations it related to are better captured by recent work on the importance of diffuse networks.⁸¹ As we have noted, the model of imperial science as a web-like space of layered networks, allows for a much more nuanced understanding of the system.⁸² And crucially, they also enable an important colonial centre like Calcutta to have its own subsidiary web.

⁷⁷ Latour, *Science in Action*, 223.

⁷⁸ Ibid.

⁷⁹ Ibid., 225.

⁸⁰ Ibid., 229.

⁸¹ See Laidlaw, *Colonial Connections* (Manchester, 2005).

⁸² David Lambert, and Lester, Alan (eds), *Colonial Lives across the British Empire: Imperial Career in the Long Nineteenth Century* (Cambridge 2006), 3.

Inevitably the strength and effectiveness of scientific networks varied over time. After the network put together by Sir Joseph Banks collapsed following his death in 1820 there was no means of bringing together the efforts of botanists in Britain and its colonies. However, a view gradually developed in Britain that there should be renewed coordination and control. That was first expressed in the 1831-32 *Report from the Select Committee on the Affairs of the East India Company*, to which Wallich gave evidence. John Lindley's *Report to the Treasury Committee on the Management of the Royal Gardens at Kew* a few years later (see Chapter Three) put Calcutta at the head of a list of overseas botanic gardens and argued that:

There are many gardens in British Colonies and dependencies: such establishments exist in Calcutta, Bombay, Sahranpur, in the Isle de France, at Sydney, and in Trinidad, costing many thousands a year: their utility is very much diminished by the want of some system under which they can all be regulated and controlled there is no unity of purpose among them ...⁸³

In response to Lindley's Report, the British Government provided funding for Kew to expand and become a more prominent institution. Once Sir William Hooker became Director in 1841 Kew developed much closer relations with the imperial network and it became central to Kew's mission. As Richard Drayton puts it:

In the story of Kew ... we may observe the terms on which the interests of naturalists and administrators came into convergence ... the future of Kew ... would depend on this faith that kings or empires might purchase their right to rule with plants and gardens.⁸⁴

As Kew revived and expanded in the 1840s its influence on the Calcutta Garden increased. After Falconer was appointed in 1848 there was no superintendent who was not closely connected with Kew, and none was appointed without Kew's blessing. Unlike scientists based in the settler colonies, those who worked in India nearly always retired to Britain, and usually close to Kew and the London scientific societies. Their contributions to British botany were not insignificant. With George King, C. B. Clarke and John Duthie all spending part of their retirement working in

⁸³ British Parliamentary Papers. *Report made to the committee appointed to inquire into the management and present condition of the Royal Gardens at Kew*, by John Lindley and others, No. 4 of Royal Gardens Committee, 1838 (House of Commons Accounts and Papers, No. 292, Vol. XXIX.259, 1840), 5.

⁸⁴ Drayton, *Nature's Government*, xv.

the Herbarium, and Prain as Director, there were no less than four former superintendents of Indian botanic gardens at Kew in 1905-06. Prain had been appointed as Director after eighteen years at the Calcutta Garden. That demonstrated how the network functioned in two directions, and provided the best botanical example of the moving metropolis.⁸⁵

Practice changed over time as well: ‘The location and definition of the empire’s centre and its peripheries were being continuously redefined and negotiated through the practices of collecting and classifying – and cannot therefore be used to explain how those practices worked.’⁸⁶ However, the important point is that the superintendents in Calcutta used their relationship with Kew as a main means of achieving their overall objectives, just as Kew used the colonial network of gardens as a way of reinforcing its own position.

In 1863 William Hooker was instructed, ‘to draw up a plan for the publication of Colonial floras in an inexpensive form and in the English language.’⁸⁷ Kew saw botanists’ other activities – supporting the economic development of the Empire, promoting horticulture and providing displays for the public – as subsidiary to this scientific project. Their colleagues in Scotland, and the botanists who practised in India, shared that view. As already shown in the Introduction, Kew’s expectations were, above all, that the Superintendent in Calcutta should be a good taxonomist with a commitment to that project. This agreed sense of purpose resulted in remarkably harmonious relations between Kew and the Calcutta Botanic Garden right up until 1914. Kew was remarkably efficient too, coping with a vast correspondence, remembering what was happening in many parts of the world, and endlessly chasing up on missing shipments, broken Wardian cases and sickly plants.⁸⁸ The quick access that the superintendents had to capable and knowledgeable decision makers at Kew contrasted strongly with the slow moving formality, and often ill-informed ways, of the Indian administration. After the Botanical Survey was set up in India (see Chapter Four) Kew sent copies of its correspondence with the

⁸⁵ Macleod, ‘On Visiting the “Moving Metropolis”’.

⁸⁶ Endersby, *Imperial Nature*, 315

⁸⁷ W. Thiselton Dyer, *The Botanical Enterprise of the Empire* (London, 1880), 9.

⁸⁸ On average, between 1861 and 1898, letters passed between Kew and the Calcutta Garden once every month or six weeks.

India Office and the Government of India for King to see. In reply King said: 'In this Survey and in ever so many other matters, Calcutta is deeply indebted to Kew: and as long as I and Prain are here Calcutta will do its best to show its gratitude.'⁸⁹

There were several reasons why the relationship between Kew and Calcutta was exceptionally close in the late nineteenth century, and why Calcutta was generally seen as one of the most important of the overseas botanic gardens.⁹⁰ Sir Joseph Hooker was the world's leading authority on the Indian flora and the two gardens were reliant on each other for the successful production of Hooker's *Flora of British India*. Kew had the most comprehensive herbarium of Indian plants, and for India, but for no other country, employed a special herbarium assistant.⁹¹ Having Kew to represent the interests of botanists to the India Office and the British Government in London was an advantage, but it did also mean that superintendents had to accept a measure of interference and control: Kew's access to senior decision makers,⁹² and its influence on appointments, inevitably meant that it was the senior partner. The superintendents were also aware that if they failed to meet expectations, their careers could be severely damaged or even ended by Kew. Kew did not feel that its central position in the network was threatened by the development of Calcutta's scientific capability though. In 1888 an article in the British *Gardener's Chronicle* (which often reflected Kew's views) reported on a visit to India by the German botanist O. Warburg. It accepted the concept of subsidiary nodes, and ended by saying:

With regard to the intimate connection between Kew and the colonial and Indian gardens, Mr Warburg thinks that it is at present most beneficial, though he looks forward to the time when they shall have developed so far as to be less dependent on a central institution.⁹³

Kew's prestige in the second half of the nineteenth century also meant that most British officials associated botanic gardens with successful and enlightened government. Between 1870 and 1872 Kew came under pressure from Acton Smee

⁸⁹ RBG Kew MR 107: King to Thiselton Dyer, 18th November 1891.

⁹⁰ The 1892 Kew Bulletin of Miscellaneous Information, for instance, provides an overseas staff list with two of its five pages devoted to India.

⁹¹ The relationship has continued to the present day, with a liaison officer from the Botanical Survey of India still regularly posted to Kew.

⁹² Joseph Hooker's prestige meant that he could speak directly and privately to very senior British officials, and even to the Viceroy himself. See, for instance, RBG Kew MR 105: Lord Ripon's letter of 23rd June 1882 to Joseph Hooker.

⁹³ *Gardener's Chronicle*, 5th May 1888, 551.

Ayrton, the minister in Gladstone's government who controlled its budget. With support from many others in the growing scientific community Hooker was largely successful in maintaining Kew's independence.⁹⁴ The outcome was publicised so widely⁹⁵ that other administrators would have hesitated to impose their wills on scientific institutions, even colonial ones. King was at Kew in 1872 and saw some of the struggle at first hand. He wrote in support of Hooker, which helped to cement their relationship.

Many plants in India were named after pioneering botanists, and the repetition of these names helped to reinforce the network and establish a common language between botanists at Kew and in India. The choice of names gives botany a particular flavour and shared interest. It was also a means of expressing admiration, as the many species with the suffix *hookeri* show. Hooker returned the compliment to colleagues and collaborators in India and elsewhere. Hooker was famously a botanical 'lumper', rather than a 'splitter', wanting to control the proliferation of names, and the creation of sub-species.⁹⁶ Janet Browne writes, 'His message was simple. Plants were to be sent to Kew – the hub of the colonial scientific network.'⁹⁷ She might, however, have added, '... unless we have a botanist in place who meets our standards.' Kew had respects for all the superintendents, and the correspondence does not show Hooker trying to impose his will on them in the same way that he did on amateur botanists in the settler colonies.

Calcutta's international network did of course involve far more than its relations with Kew, and extended well beyond the British Empire. The Garden's early system of exchanges with other botanic gardens declined after Wallich left, and particularly when Thomson lost his grip on the correspondence, but it revived under Anderson.⁹⁸ By that time there were botanic gardens not only in Europe but also in America, in most settler colonies, and in the other more important imperial possessions. In the late nineteenth century Calcutta had particularly productive contacts not only with Buitenzorg, Peradeniya and Kew, but also with Berlin, St Petersburg, Paris,

⁹⁴ Drayton, *Nature's Government*, 219.

⁹⁵ Ibid.

⁹⁶ Endersby, *Imperial Nature*, 154-62.

⁹⁷ Janet Browne, 'Biogeography and empire,' in Jardine, Secord and Spary (eds.), *Cultures of Natural History*, 313.

⁹⁸ RBG Kew DC 155: Anderson to Joseph Hooker 22nd April 1866.

Singapore and Melbourne. These contacts were supplemented by less regular exchanges with a wide range of other gardens.

Relationships with these other gardens could be bolstered by personal contacts: when Anderson went to Buitenzorg in 1861, he took the opportunity to persuade one of the staff, Sulpiz Kurz, to transfer to Calcutta. In the mid-1860s the French botanist, Jean Baptiste Pierre, worked with Anderson at Calcutta. Fifteen years later he was the head of the French botanic garden in Saigon, and Thiselton Dyer, the Assistant Director at Kew, pointed out in 1880 that on a visit there, Pierre had ‘... generously presented a fine series of specimens of its little known vegetation, in graceful acknowledgement of the encouragement which in his early studies many years ago he received at the Calcutta Botanic Garden from Dr Anderson.’⁹⁹

Such gentlemanly behaviour tended to prevail over colonial rivalries. As we have noted, the overriding commitment of the superintendents was to their science, and they were usually proud to report on collaboration with the gardens of other European nations. The superintendents were generally glad to host international visitors as well, as such interchanges reduced any lingering sense of professional isolation. In this sense, botanists operated at a global rather than an imperial level, and the knowledge of individual empires became a collective imperial knowledge; it was shared among the powers and propagated at the increasing number of international exhibitions in Asia as well as Europe.¹⁰⁰

Inevitably, however, there was some competition. In 1856 Thomson had suggested that the Calcutta Garden could become the Kew of the East¹⁰¹ and that phrase was to haunt his successors. In 1880 Thiselton Dyer, implied that Peradeniya had a better claim to be regarded as the Kew of the East (see Chapter Four). That suggested that Calcutta, still being rebuilt and landscaped by King, had not quite made the grade. By the 1890s Calcutta was being referred to as the Kew of the East, but anxiety returned

⁹⁹ Thiselton Dyer, *The Botanical Enterprise of the Empire*, 27.

¹⁰⁰ e.g. Exhibition of Arts, Manufactures and Raw Materials of the Presidency, Madras 1855 and Calcutta International Exhibition, 1883-84.

¹⁰¹ BL IOR F/4/2695 No. 190938: Report on the Honorable Company’s Botanic Garden, 24th September 1856, 27.

in 1906 when the *Journal of Horticulture* in Britain again applied the term to Peradeniya.¹⁰² Calcutta never quite achieved a position of unrivalled superiority.

As well as being an important institution for understanding colonial science, Calcutta Botanic Garden played a role in alerting the East India Company to environmental issues. Richard Grove has shown that, even in the eighteenth century, there was unease about the colonial impact on the environment.¹⁰³ Indeed it can be argued that the East India Company's interest in botanic gardens was partly a result of its insecurity in new environments, and desire for reassuring expertise. In order to understand exactly what role the Calcutta Garden played, however, it is important to look carefully at the sequence of events. At the end of the eighteenth century Kyd and Roxburgh's concerns about famine suggested a feeling that the natural order in India was being disturbed, and that the British should apply their knowledge to ameliorate the situation. Kyd and Roxburgh were both also concerned about the depletion of resources, particularly timber. As a result they tried to grow teak in the Botanic Garden, and later, incorporating indigenous skills, in official plantations elsewhere in Bengal as well.¹⁰⁴

Roxburgh's broad scientific interests included the study of climate: he monitored temperature and kept detailed climatic records. He was also concerned about drought. However, as Grove points out, Roxburgh could not conceive of climatic variation taking place on a regional basis.¹⁰⁵ It was only after Humboldt published his ideas on isotherms that surgeons in India began to understand such phenomena.¹⁰⁶ By the 1820s, when Humboldt's ideas were becoming better known, Wallich was superintendent in Calcutta. Grove has highlighted Wallich's work on the Plantations Committee, set up by the Governor General in 1823.¹⁰⁷ Wallich was certainly concerned about timber growing, and the declining availability of sissoo trees and bamboo. He produced a series of reports on behalf of the Plantations Committee,

¹⁰² *Journal of Horticulture*, 22nd March 1906.

¹⁰³ Grove, *Green Imperialism*, 81.

¹⁰⁴ *Ibid.*, 406.

¹⁰⁵ *Ibid.*, 407.

¹⁰⁶ J. Forbes Royle, in his account of the Botanic Garden at Saharanpur in the *Journal of the Asiatic Society* (Calcutta, February 1832) clearly describes the potential for growing similar crops in comparable climates.

¹⁰⁷ Grove, *Green Imperialism*, 410.

but conservation may not have been his only priority. David Arnold recognises that some colonial surgeons played an important role in publicising environmental concerns, but questions whether we should see Wallich as one of those, ‘autonomous scientists, critical of laissez faire, often on ecological grounds, who first emerged in the colonial world.’¹⁰⁸ Rather, he argues that Wallich’s advocacy of forest regeneration ‘can best be understood not within a conservationist paradigm but as part of an imperial concern with exploiting India’s material “riches” and implementing “improvement” ideology.’¹⁰⁹ There is some support for Arnold’s view: in his correspondence Wallich was invariably anxious to placate his employers, and he did not challenge the East India Company to take a more active approach to conservation in the way that later surgeons in other presidencies did.

In the period after 1833 that is the focus of this thesis it is more difficult to attribute environmental concerns to the Botanic Garden. Grove argues convincingly that East India Company surgeons, and particularly Alexander Gibson, Hugh Cleghorn and Edward Balfour, were key figures in making the case that deforestation was causing dessication and environmental degradation. They were concerned that deforestation would cause fundamental climate, and therefore agrarian and economic, change. By pressing the East India Company to adopt long-term sustainability as a priority, rather than the maximisation of land revenue, they took risks with their careers.¹¹⁰ However, Gibson was based in western India (at the Presidency Botanic Garden at Dapuri) and Balfour and Cleghorn in Madras. In the 1840s and 1850s, when they were putting forward their cases, and mobilising the British Association for the Advancement of Science to support them, the Botanic Garden in Calcutta was being administered by a series of superintendents whose tenure was brief. Falconer, who arrived in 1848 and stayed for seven years, was asked by the Government to report on the teak plantations set up in Bengal between 1800 and 1820. He found that they had been poorly looked after and recommend that they be closed down,¹¹¹ so effectually there was little input from Calcutta after Wallich’s departure into the attempts to tackle environmental degradation.

¹⁰⁸ Mahesh Rangarajan, Review of Grove, *Green Imperialism*, The Telegraph, Calcutta, 10 Nov 1995.

¹⁰⁹ David Arnold, ‘Plant Capitalism and Company Science’, 901.

¹¹⁰ Grove, *Green Imperialism*, 436.

¹¹¹ British Library India Office Records [hereafter BL IOR] F/4/2648 No. 172113 Revenue Dept. Collection No. 1, letter of 7th March 1854.

The network of botanic gardens had, however, been important in providing a facility to collect information to monitor the environment. The later superintendents in Calcutta, and particularly Anderson and King, continued to take an interest, but once the Forest Department was set up in 1866, the Government ceased to ask the Botanic Garden for advice on the management of forests. In the 1890s King and Prain did draw attention to the problem of over-collecting of orchids and ferns in Sikkim,¹¹² but did not try directly to influence wider policy.

Using networks to exchange scientific and horticultural knowledge with local people, and to communicate with government officials

In his writing about colonial Ceylon, Sujit Sivasundaram has been seen as challenging, ‘... the presumption that the spaces of the colonial world were devoid of meaning and mere receptacles of an all-powerful, inward-moving European rationality.’¹¹³ Although the location and history of Calcutta Botanic Garden were very different to those of Peradeniya, Sivasundaram’s basic points about the importance of the natural knowledge of the Kandyans who cultivated the site of Peradeniya before the British arrived, and the way in which the British elaborated the dichotomies between the low country and the high country of Ceylon,¹¹⁴ still offer valuable insights into understanding how botanic gardens were fitted into pre-existing local cultures of cultivation. C. A. Bayly and others have shown that there were already sophisticated science and technology traditions in South Asia.¹¹⁵ Bayly made clear how important local information networks were to the British in India, and noted the sophisticated dialogue about geography, physic and physics that took place between British surgeons and Indian practitioners.¹¹⁶ Consequently, the European approach to science never became completely dominant. Western medicine, for instance, only established itself very gradually in India, and even in the twenty-first century other approaches to health and wellbeing are still widely

¹¹² RBG Kew MR 227 CBG Annual Report for 1898-99 para. 1.

¹¹³ Livingstone and Withers, *Geographies of Nineteenth Century Science*, 7.

¹¹⁴ Sujit Sivasundaram, ‘Islanded’ in Livingstone and Withers, *Geographies of Nineteenth Century Science*, 136.

¹¹⁵ Arnold, *Science, Technology and Medicine in Colonial India*, 4-5, lists some recent works that focus on Indian science under pre-colonial century rulers.

¹¹⁶ C. A. Bayly, *Empire and Information* (Cambridge, 1996) ch. 7.

practised. Science is a culture-bound activity, and that there is no such thing as “objective” science, separate from the values of the society in which it is constructed.¹¹⁷ As Bruno Latour points out:

There is no Great Divide between Western and local knowledge. Scientists only build galleries/networks and make traces of all sorts circulate better by increasing their mobility, speed, reliability and ability to combine with each other. They are a combination of scientific, technical, economic, political and managerial elements. These networks allow them to act at a distance, which sometimes allows spatial or chronological domination of the periphery.¹¹⁸

The point about European botanists was not so much that they knew more about plants, as that they came with a global network and systems for classifying the world’s flora (see Chapter Two). It was that ability to combine things that privileged their approach in the nineteenth century, and meant that working out the actual taxonomic relationships of Indian plants was a European project, carried out according to European classificatory criteria. Even so, once European scientists started to work in other continents, they had in practice to revise their approaches to accommodate alternative ways of knowing and understanding the world. The thesis will show that superintendents were never able simply to mould the Garden as they wished because they were dependent on the cooperation of their gardeners, artists and clerks.¹¹⁹ Place and Locality remained important in the construction of botanical knowledge, and European botanists relied on local informants whose contribution has, until recently, been underrated.¹²⁰ Appropriately enough, quite a few of the collectors were Anglo-Indians, whose culture and learning often combined Indian and European traditions.

Evaluating the plant resources of South Asia was therefore a joint enterprise. There were far too few Europeans to scour the whole country, and they generally had

¹¹⁷ This is accepted by almost all recent writers on the history of science; see Arnold, *Science, Technology and Medicine*, 1-2, for a good summary of the modern understanding, and also Pratik Chakrabarti, *Western Science in Modern India*, 17-19.

¹¹⁸ Latour, *Science in Action*, 232.

¹¹⁹ See, for instance, Wallich’s letter of 8 January 1828 (BL IOR F/4/961 No. 27345), stressing the need for William Gomez to accompany him to Britain to help him sort his herbarium, William Griffith’s remarks (cited in Chapter Three) on the key role of one of the gardeners, Buxoo, and Thomas Anderson’s eagerness to have the Calcutta painter, Lutchman Singh, with him in Darjeeling in 1862 (RBG Kew DC 155: Anderson to Joseph Hooker, 14th May 1862).

¹²⁰ Kapil Raj, *Relocating Modern Science*; Lynn Zastoupil, ‘Intimacy and Colonial Knowledge’, *Journal of Colonialism and Colonial History*, 3, 2 (2002), 2-3.

neither the time nor the talent to draw what they found. Throughout the correspondence and reports from the Calcutta Garden there are scattered references to the key role of the head gardeners, and the valuable work of the Garden's artists. The circulation of the images created by these artists around the network added much to the prestige and influence of the Garden. As Sivasundaram reminds us when speaking of Harmanis de Alwis Seneviratne, the head draftsman at Peradeniya, '... his position and role speak to a whole host of other now nameless indigenous collaborators who made contributions not just to British botany in Ceylon but to science elsewhere.'¹²¹

In his attempts to "improve" Indian agriculture and horticulture Wallich developed close relations with some of the Indian zamindars and merchants who were members of the Agri-Horticultural Society, and with Indian officials like Ramcomul Sen. These relationships went beyond the merely formal and polite. In the index to his letters, Wallich wrote of Ramcomul Sen:

Head native under Dr Wilson at the Asiatic Society. He was an extremely clever and learned baboo He held many years an important situation in Fort William, and died as the Head Native Servant of the Bank of Bengal in 1844. He was much respected by all. The Government placed much confidence in him. He was throughout member of the Tea Committee. He published an excellent English and Bengalee Dictionary in 2 Vols.¹²²

Ramcomul Sen similarly respected Wallich. In 1842 he wrote to the Education Committee offering to fund a Medal for the best student of Botany at the Medical College, requesting that 'as a favor (*sic*) and token of respect for so great a person that the medal I now present may be denominated "The Wallich Medal".'¹²³ By this time Wallich and Sen had known each other well for twenty-five years. Wallich represented an older tradition of respect and interest in Indian society, but there is little evidence to suggest that his successors managed to develop similarly close relationships.

¹²¹ Sujit Sivasundaram, 'Islanded' in Livingstone and Withers, *Geographies of Nineteenth Century Science*, 135.

¹²² CNH Kolkata Wallich Correspondence: Index to the Letters.

¹²³ CNH Kolkata Wallich Correspondence: Ramcomul Sen to Wallich, 22nd September 1842.

The early efforts by the British at collaboration were partly aimed at obtaining the information held by Indians themselves on their flora, but there was also an aspiration for knowledge to travel in the other direction. From the beginning of the nineteenth century British rulers justified their presence in India by saying that they would enlighten the population by passing on ‘scientific’ knowledge.¹²⁴ However, very few Indians became scientifically educated before the 1860s, partly because of a lack of interest, but more because the British were reluctant in practice to organise serious transfers of knowledge.

An exception, however, was the British concern to reduce the incidence of disease by training doctors in western medicine, and they opened the medical college in Calcutta in 1835. Wallich’s successors continued to teach the botany course for the rest of the nineteenth century. As nearly all the British botanists had acquired their early knowledge when they were medical students it might have been expected that the Calcutta medical college would become a source of Indian botanists. One of Wallich’s former students, W. C. Ondaatje, was in fact appointed acting head of the garden at Peradeniya in 1843,¹²⁵ but was replaced a year later by the British botanist, George Gardner.¹²⁶ After that, the development of a collaborative network of botanically inclined British and Indian officers stalled. Indians who graduated from the medical college could get a reasonable living from medical practice, so had little incentive to specialise in botany, which only offered four or five paid jobs over the whole country. However, collaboration did not cease altogether. U. C. Dutt, for example, was a medical college graduate who worked with both George King and George Watt (see Chapter Four).

In spite of the difficulties, Indian interest in western science was developing by the 1880s. By then, educated English-speaking people were beginning to take advantage of improved communications to establish all-India organisations. Mahendra Lal Sircar, a medical doctor, had founded the Indian Association for the Cultivation of Science in 1876, and his friendship with the Jesuit Father Lafont showed that

¹²⁴ See Wellesley’s views in Mildred Archer, ‘India and Natural History: the Role of the East India Company, 1785 – 1858’ in *History Today* Vol IX, 738 (1959).

¹²⁵ Desmond, *European Discovery of the Indian Flora*, 163.

¹²⁶ Ibid.

productive partnerships between Indian and European scientists were possible.¹²⁷ As higher education slowly expanded the first substantial group who had been trained in western sciences other than medicine emerged. P. N. Bose became the first Indian Government scientific officer when he was appointed to the Geological Survey in 1880.¹²⁸ J. C. Bose (no relation) came back to Calcutta in 1885 with a Cambridge natural sciences degree and P. C. Ray returned with a D. Sc. from Edinburgh in 1888. When, in 1885, it was time for the Asiatic Society of Bengal to celebrate its first hundred years, it was its Indian Secretary, Rajendralal Mitra, who wrote an authoritative survey of its achievements, with P. N. Bose contributing the volume on the natural sciences.¹²⁹ By the middle of the 1890s a number of Indian scientists were members of the Asiatic Society,¹³⁰ and they wrote fourteen of the 169 scientific papers published in the *Journal of the Asiatic Society*, between 1886 and 1895.¹³¹

However, these scientists were concerned at how slowly problems in health and agriculture were being addressed, and disappointed at the reluctance of the Government to give them real responsibility.¹³² Science thus became another contested area as educated people began to challenge British rule.¹³³ Only in the 1900s did Indians begin to obtain substantial numbers of senior publicly funded positions, fifty years after the Royal Proclamation of 1858 had promised that they would.¹³⁴ The Indian Universities Act 1906 opened the way for research in universities, and the Indian Institute of Science was founded in Bangalore in 1908. Whilst there were more science courses at the universities, there were still not many openings, and the ‘colonial’ sciences, like biology and geology, which had tended to be dominated by the IMS, were less popular than physics, maths and chemistry.¹³⁵

¹²⁷ Chakrabarti, *Western Science in Modern India*, 170.

¹²⁸ Kumar, *Science and the Raj*, 215.

¹²⁹ Mitra, Hoernle, and Bose, *Centenary Review of the Asiatic Society of Bengal from 1784 to 1883* (Calcutta, 1885).

¹³⁰ Arnold, *Science, Technology and Medicine*, 156.

¹³¹ Visvanathan, Shiv, ‘The Rise of Industrial Research’ in Habib, Irfan & Raina, Dhruv (eds.), *Social History of Science in Colonial India* (New Delhi, 2007), 291.

¹³² Kumar, *Science and the Raj*, 213-222.

¹³³ *Ibid.*, 222-227.

¹³⁴ Thomas Metcalf, *Aftermath of Revolt: India 1857-70* (Princeton, 1964), 23-24.

¹³⁵ Kumar, *Science and the Raj*, 180-191.

Even when Indians started to take an interest in botany, men like Joseph Hooker, Prain and Gage found it difficult to engage with them, and to know how to respond. They acknowledged some ability, but then stressed that the work was still not up to European standards. Joseph Hooker's carping comments on Indian artists are typical:

I should call attention to the fact that, excellent as the drawings are in many respects, as representatives of the plants portrayed they err in manifesting that tendency to enlarge, which is a besetting sin of India botanic artists; and that the analyses leave much to be desired in the matter of proportion and accuracy... In no case do these defects appear to me to detract materially from the value of the illustrations as a means of identifying the plants represented.¹³⁶

Prain seemed similarly perplexed as to how to react to aspiring Indian taxonomists:

I should be prepared to expect little work of any value from native gentlemen but I think that if carefully selected these could do good and useful work under supervision at headquarters and in any case I feel that the Survey may legitimately take its share with other branches of Government service in providing openings for the willing and talented workers who are trained in Indian colleges.¹³⁷

In 1909 the Botanical Survey got an extra Rs.12,000 p.a. from the Government of India to employ three new local assistants – two for the herbarium and one for photography. By hard work and application they were able to start altering the British stereotypes: by the following year Gage was writing 'The Indian assistants are very good indeed, quite surprisingly so.'¹³⁸ The emergence of senior Indian staff meant that the Garden became a different sort of place, more integrated into the local community, and gave it a wider network after 1910.

Introducing European scientific ideas and practice was one way in which the superintendents were involved in trying to influence Indian thought. There were, however, many other ways in which the botanical network interacted with local people. As Chapter Five will show, a series of British people in India tried to "improve" Indian agricultural and horticultural practice. The importance of the Botanic Garden's long effort, particularly under Wallich, to engage with and

¹³⁶ Introduction to 'A Century of Indian orchids' in *Annals of the Royal Botanic Garden, Calcutta* Vol. V part 1, 1895. In contrast, in his introduction to 'The Orchids of the Sikkim-Himalaya' (Vol. VIII of *The Annals of the Royal Botanic Garden, Calcutta*, 1898), King was generous in his praise for the Lepcha collectors who obtained the orchid specimens, and the sons of the Nepalese coolies who coloured in the drawings produced by Robert Pantling, the Deputy Superintendent of the Cinchona Plantation.

¹³⁷ RBG Kew DC 158: Prain to Gage, 8th May 1907.

¹³⁸ RBG Kew DC 158: Gage to Prain, 22nd June 1910.

encourage amateur and professional gardeners has been underrated, but did ultimately bear fruit. By the 1850s plenty of nurseries had been established in Bengal and the Garden was able to step back from distributing plants and seeds. The emphasis then shifted to encouraging the enjoyment of gardens and landscapes, and their supposedly healthy and uplifting effects (see Chapter Six).

The policies of the East India Company and the Government of India towards the Garden will be discussed in more detail in later chapters. This chapter, however, provides an opportunity to situate the Garden within the administrative structure, and consider how the superintendents actually engaged with the policy-making officials and learned how to meet the expectations of the colonial authorities. The first superintendents, backed by Sir Joseph Banks, had been largely successful in setting their own agendas, but gradually the Government began to exert closer control. There was no department responsible for the Garden in the early nineteenth century, but the superintendents were able to network with a series of senior officials. H. T. Colebrooke was something of a mentor to Roxburgh and Sir Charles Metcalfe played a similar role for Wallich.¹³⁹ Early governors general, such as Wellesley and Auckland, sometimes behaved as patrons of the Garden. Wallich, in his turn, was appropriately deferential. Official interest declined in the late 1840s, but revived in 1856 when Lord Canning became Governor General.

After that, however, governors general ceased to have any close involvement. With the ending of East India Company rule in 1858 the Garden began to report through the Lieutenant Governor of Bengal. From the 1860s the new Government of India prioritised efficient administration.¹⁴⁰ Accountability became the watchword, and formal procedures took priority over informal networking. After 1861 forms and records proliferated, the first printed stationery appeared and the Botanic Garden was expected to produce annual reports.¹⁴¹ Against this background, superintendents of the Garden formed networks with sympathetic officials based on informal, social contacts through organisations such as dining club, and the Garden gained some

¹³⁹ BL IOR F/4/1132 no. 52707: Extract Fort William General Consultation, 12th October 1830.

¹⁴⁰ Sarvepalli Gopal, *British Policy In India (1858–1905)* (Cambridge, 1965), 120.

¹⁴¹ Anderson's letter of 8th January 1865 to Joseph Hooker is the first example of a 'Royal Botanic Garden, Calcutta' printed letterhead, although other organisations such as the Agri-Horticultural Society, introduced letterheads in the 1850s.

modest extra funding. Anderson wrote in 1865 that (in contrast to the Governor General) ‘The Government of Bengal, a government of well educated men and personal friends of mine, know what a garden is ...’¹⁴² King and Prain operated in a similar way and made sure that they benefitted from such contacts.

Anderson and King used their annual reports to put forward ideas and recommendations. Sometimes the Lieutenant Governor of Bengal, who became directly responsible for the Garden in 1874, wrote a detailed minute in reply. King gave a good example of how he dealt with the two governments, of Bengal and India, in a note he wrote later:

About the end of Sir G. Campbell’s term of office, it was proposed to make the garden provincial. I did not know what this might mean, and I viewed the proposal with some alarm, as possibly implying a further reduction of funds and a curtailment of the scientific functions of the institution. Sir Joseph Hooker, then Director of Kew, was also alarmed when he heard of this proposal, and he wrote and advised me to go to General R. Strachey (then a member of the Government of India) who, as a personal friend of his own, and as a friend of science, would, Sir Joseph thought, give me useful advice ... I accordingly consulted General Strachey, who strongly advised me to accept, without a murmur, the proposal to make the garden provincial ... Experience has entirely confirmed General Strachey’s forecast. The garden is now a place to which a foreign visitor may be taken without feelings of shame.¹⁴³

By the 1870s the overseas scientific network and the administrative one in India had become entwined, and it was natural for King to consult Kew first, and agree how to proceed, before using Strachey as a friend at court to get reassurance. As King noted, the new arrangement worked well, and he was not involved in extensive negotiations with either government again until the 1880s. Then, the setting up of the Botanical Survey of India (see Chapter Four) created an immense amount of correspondence to make sure that the botanical establishment maintained a united front. King was skilled at keeping the initiative without actually going against instructions, as this extract from the same Note quoted above, about collecting in Assam, Burma and the Andamans, shows:

¹⁴² RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 22nd February 1865.

¹⁴³ RBG Kew MR 107: Minute No. 3384, 3rd August 1887, from Colman Macaulay, Secretary to the Govt. of Bengal, Municipal Dept. to the Secretary to the Government of India covering note of 17th June 1887 from Dr King.

Now, as a matter of fact, I have without any official instructions, but with the knowledge and approval of the Bengal Government, maintained at various times within the last ten years, collectors in each of those three regions ...¹⁴⁴

In other words, a well-organised and clear thinking Superintendent, who knew what he wanted to do, could maintain the initiative to a large extent. After his retirement King again wrote on how he got things done, and showed how informal networks still operated despite the stifling formality of the system:

The success that has in the past attended the efforts made to extend and complete the Botanical Survey of India has depended largely on the kindly help of the heads of other departments and the generous interest taken by officials in the areas in which the actual survey work has been done. The Superintendent has been able to secure the co-operation of those in command of punitive columns, survey parties, exploring expeditions and the like, with the greatest benefit to the work in hand and the smallest possible cost to the Government. But this is rarely because of his official position; with hardly an exception this invaluable assistance has been given in consequence of personal friendship resulting from social intercourse of the kind referred to.¹⁴⁵

By then King had got used to operating in India's formalised late nineteenth-century bureaucracy, and even admitted that he would not want to be involved in the different sort of networking required in a more devolved and democratic system: 'Singapore is cursed with a legislative Council, and the Garden funds form the subject of an annual vote. Commend me to an absolute Government!'¹⁴⁶

Conclusion

This chapter has made it clear that the Garden had a distinct identity, not only because of the unique space that it occupied, but also because of the ever-changing interpretations of it as a place. Its many identities – as a colonial institution, as a scientific, economic and aesthetic space, as a botanic garden and as a community of hundreds of people - all help to situate it. But, as we have noted earlier, places, '... are usually ... located in a series of extensive economic, political, and cultural *networks* with varying geographical scope ...'¹⁴⁷ Place as a concept derives from how humans perceive their surroundings, and that perception is partly based on the networks they

¹⁴⁴ *ibid.*

¹⁴⁵ RBG Kew DC 158: Sir George King to Sir Thomas Holderness, India Office, 10th August 1907.

¹⁴⁶ RBG Kew DC 156: King to Thistleton Dyer, undated (between 1887 & 1890).

¹⁴⁷ J. Agnew, 'Space and Place' in Agnew and Livingstone (eds.) *Handbook of Geographical Knowledge*, 23.

understand and participate in. It is important to realise that the Garden was an active participant in this process – it not only took part in, and benefitted from, its networks; it helped to form them and was an important contributor.

Networks were vital to the work of the Botanic Garden. They provided a continuing stream of specimens, they dispelled feelings of isolation and they were a source of advice and support. From the start the networks needed to be worldwide so that botanists could compare and experiment with plants that grew in similar climates on other continents. It is impossible to understand the success of botanists' networks without appreciating their strong commitment to botany. However, they did require other qualities to make them credible participants.

Kew's emergence as a coordinating body from the 1850s gave the Garden a "friend at court", and provided a focal point for the previously diffuse networks between British botanists. The superintendents in Calcutta appreciated Kew's support, so the relationship was generally a positive and beneficial one. Similarly, relationships with other overseas gardens were usually conducted in a spirit of professional cooperation, although Calcutta became concerned when its primacy as the "Kew of the East" seemed to be threatened. The Garden was less successful in diffusing botanical knowledge. Later superintendents failed to build up a productive network with the emerging Indian scientific community until the start of the twentieth century, despite Wallich's early success in developing relations via the Agri-Horticultural Society and the Medical College.

Close attention to how the networks between botanists in India and in Britain operated confirms that simple centre-periphery ideas fail to capture the complexity of the relationship. The style of networking changed as communications improved. Faster contact allowed for tighter central control from the centre, but influences also flowed the other way, and the control was balanced by more discussion and a closer working relationship.

Chapter Two

Botany and botanic gardens in India before 1833

When he went on leave to Britain in 1828, Nathaniel Wallich, the Superintendent of the Botanic Garden, took with him thirty tons of botanical specimens and material.¹ He stayed in Britain for four years,² and he spent much of his leave sorting, writing up and distributing this collection.³ Specimens went to most of the leading botanists in Britain and Europe, and their resultant publications meant that European knowledge of Asian plant life increased significantly.

Europe was enriched by Wallich's collection, but its removal had major implications for botany in India. Chief among these were the extent to which scientific work would be done in India rather than Europe, the rules under which the Garden would operate, and the role of patronage in its future. This chapter will start with a brief account of how the East India Company began to address these issues, and the differing strategies of the three main superintendents of the Botanic Garden between 1786 and 1833. Following that, it will describe how Wallich's huge collection was accumulated, and look at what the Garden had achieved by the end of the 1820s in classifying and recording India's plants, publishing accounts of them and introducing new or improved species of economic value.

It is important to remember that, in the late eighteenth century, the East India Company had almost no experience of running a scientific institution. It was therefore addressing unfamiliar challenges as the Garden's main functions were negotiated and defined during its early years. The Garden's role was always to accumulate knowledge about what grew in India, but Roxburgh, when he became the

¹ BL IOR F/4/961 No. 27345, p. 97, Wallich to Acting Secretary to the Government, 8th Jan 1828.

² Wallich was actually away from Calcutta for five years (from 1828-33) as his voyages to and from Britain each took nearly six months.

³ Desmond, *European Discovery of the Indian Flora*, 88-90.

second superintendent, shifted the emphasis from the acclimatisation of economic crops to the cataloguing of the entire Indian flora, and introduced the apparatus that allowed the Garden to become an incipient 'centre of calculation'. Roxburgh's departure forced the Company to think more about what it meant by science, and what functions it wanted the Garden to perform. They found it difficult to decide on a replacement and there were four years of confusion before Wallich was appointed. Like Roxburgh, he prioritised science, but was given less scope by the East India Company to practise it.

As the Garden established itself questions inevitably arose about who would control it. During the Garden's first forty years a number of individuals and institutions asserted the right to influence its work, including the Governor General and his officials in Calcutta, the Directors of the East India Company in London, the British scientific establishment represented by Sir Joseph Banks, and the emerging network of botanists in India. As a result of these debates and discussions the science of botany became entrenched in the structure of East India Company, and the employment of scientifically qualified people came to be seen as important, if not essential.⁴

Early European interest, crop transfer and the foundation of Calcutta Botanic Garden

*'Yet the leaf is the chief product and phenomenon of Life: this is a green world, with animals comparatively few and small, and all dependent upon the leaves. By leaves we live.'*⁵

Plants sustain most terrestrial animal life, so have always been a subject of human interest. Until the nineteenth century plants were even more important as they were the main source not only of food but also fuel, construction materials, ships, medicines, textiles and dyes. Over the centuries, farmers gradually improved crop yields by careful selection, and sailors and traders transferred crops between different regions. The pace of those transfers accelerated when Europeans began to settle in America: potatoes, maize, tomatoes, cassava, cocoa and tobacco had been introduced to the Old World by the end of the seventeenth century, and sugar, coffee, bananas,

⁴ Burkill, *Chapters on the History of Botany*, 103.

⁵ Patrick Geddes, Farewell Lecture at University of Dundee, 1919.

rice and wheat to the New.⁶ The consequences were immense: there was a great expansion of trade, and some estimates suggest that the new crops enabled the population of China to increase by an additional thirty per cent.⁷ It has similarly been argued that it was the spread of potato cultivation in Europe in the eighteenth century that made the Industrial Revolution possible.⁸

There had been some attempts to list and classify plants for over two thousand years. But the gradual development of a Baconian scientific outlook after the Renaissance resulted in a more systematic approach, just as it led to much more accurate depictions of plants. As more and more Europeans travelled beyond their continent, and began to report on the plants and products they found, botany gradually emerged as a subject in its own right. The term “botanist” came to denote a new group of specialists ‘learned in the taxonomy and nomenclature of plants.’⁹ Botany was one part of a larger project, cataloguing animals, rocks, chemical elements and stars as well as plants.

At first the focus was on American plants, but by the end of the seventeenth century European naturalists such as Hendrik van Rheede¹⁰ and Engelbert Kaempfer¹¹ were also beginning to write about Asia. In the eighteenth century the great Swedish botanist Carl Linnaeus systematised botany in his *Species Plantarum*, published in 1753 (and continuously updated during the following twenty years). It initially described 5,900 species,¹² but Linnaeus encouraged his students to travel all over the world, and they quickly started adding to his lists.¹³ Linnaean classification, based on, ‘systems of taxonomy that reduced plants to specimens, numbers and names so that a specimen, once identified, represented any plant of its type anywhere in the world ...’¹⁴ became a prime instrument of colonial exploration.

⁶ Crosby, *The Columbian Exchange*.

⁷ Ibid., 198.

⁸ Brockway, *Science and Colonial Expansion*, 36.

⁹ London Schiebinger and Claudia Swan (eds), *Colonial Botany: Science, Commerce, and Politics in the Early Modern World* (Philadelphia, 2004), 10.

¹⁰ H. A. Van Rheede tot Drakenstein, *Hortus Malabaricus*, 12 vols. (Amsterdam, 1678-1703).

¹¹ Engelbert Kaempfer, *Amoenitatum exoticarum politico-physico-mediarum* (Lemgo, 1712).

¹² Wilfred Blunt, *Linnaeus: the Compleat Naturalist* (London, 1971), 214.

¹³ Ibid., 183-192.

¹⁴ Staffan Muller-Wille, quoted in Schiebinger and Swan, *Colonial Botany*, Introduction, 7.

In the eighteenth century botanists and administrators also began to consider how crop exchanges could be better organised. The French Jardin du Roi in Paris was first in the field. Its success in arranging the transfer of coffee plants from Asia to the Caribbean was an early demonstration of what might be accomplished.¹⁵ The Dutch were also active, and by the middle of the eighteenth century other acclimatisation gardens had been established by the Swedes at Uppsala, and by the British at Kew. Organising plant transfers did, however, turn out to be more challenging than expected. Most plants died on the long sea voyages, and seeds only survived if they were carefully packed. Even if plants reached a European entrepôt, and were successfully revived in glasshouses there, facilities were still needed to nurse and tend them if and when they reached their final destination. That suggested that it would be valuable to have officially sponsored botanic gardens overseas, as well as in Europe. Consequently, in Britain, Sir Joseph Banks, the President of the Royal Society from 1778 to 1820, began to promote the idea of a network of botanic gardens that would allow the organised transfer of plants to and from Britain's various possessions.¹⁶ Overseas botanic gardens like Calcutta can therefore be seen as the logical outcome of the growth of interest in botany in the eighteenth century and of European colonial expansion.

The previous chapter made it clear that European botanic gardens had to fit into pre-existing local cultures of cultivation. By the time of the first European contacts in the sixteenth century, India had a sophisticated and deeply embedded plant culture. Farmers over the centuries had selected what grew best in the different parts of South Asia, and rulers had developed gardens as a means of displaying their wealth and taste.¹⁷ In some cases rulers also took an interest in what their estates produced, and how yields could be improved: the great Mughal gazetteer, the *Ain-i-Akbari*, discusses economic crops including sugarcane, indigo, hemp, poppies, cotton, pulses, rice and melons.¹⁸ Irfan Habib has demonstrated that the Mughal emperors imported

¹⁵ Brockway, *Science and Colonial Expansion*, 58.

¹⁶ David Mackay, *In the Wake of Cook: Exploration, Science and Empire, 1780-1801* (London, 1985), Introduction.

¹⁷ One of Babur's first acts after the Mughal conquest of northern India was to lay out gardens in Panipat and Lahore – see Elizabeth B. Moynihan 'But what a happiness to have known Babur!' in James L. Wescoat, Jr. and Joachim Wolschke-Bulmahn (eds.) *Mughal Gardens: Sources, Places, Representations, and Prospects* (Harvard 1996).

¹⁸ Blochmann, H., *The Ain-i-Akbari* (Calcutta, 1873), Ain 27-28.

a wide variety of fruit trees from Iran and central Asia,¹⁹ and recognised the importance of improving crops by such techniques as grafting.²⁰ Amongst Hindus of course, plants were integral to many religious practices, and played a key role in medicine.²¹ However, the Europeans who came to India in the seventeenth and eighteenth centuries introduced a new approach to plants. They treated them as components of a wider botanical order, and wanted to see how Indian plants related to what grew elsewhere. They also brought a more focused utilitarian approach. They collected and wrote about plants systematically in a way that had not been done before, even though they often ignored their ritual and emotional significance.

Until the second half of the eighteenth century all the Europeans who attempted to examine the Indian flora were based in small coastal settlements, and had limited opportunities to travel in India. However, the British gradually exerted control over a larger swathe of territory. That had several consequences for scientific collecting. Firstly, it became easier for British officers with interests in natural history to collect over wider areas. Secondly, the number of British officials increased, and so did the number of surgeons appointed to the Indian Medical Service to look after their health. Thirdly, the East India Company began to derive a larger and larger proportion of its revenues from rents. That gave it an interest in improving the productivity of the land, and hence the introduction of new or improved economic crops.²²

In the 1770s and 1780s the main British presence in India was in Bengal and in South India. There were stirrings of botanical interest in both. In Calcutta, the capital of Bengal, rich Company servants experimented with exotic plants in their gardens.²³ In the south, around Madras, the interest was more focused. It sprang initially from the activities of Protestant missionaries based in the Danish colony of Tranquebar, some

¹⁹ Irfan Habib, 'Notes on the Economic and Social Aspects of Mughal Gardens' in Wescoat and Wolschke-Bulmahn, *Mughal Gardens*, 128-129.

²⁰ Ibid., 129.

²¹ See Naveen Patnaik, *The Garden of Life* (New York, 1993), 1-6

²² Axelby, 'Calcutta Botanic Garden and colonial re-ordering', 153.

²³ In his letter of 16 June 1786, quoted in Sir George King, 'A Short Account of Colonel Kyd', *Annals of the Royal Botanic Garden*, 4 (1893), vii, Sir John Macpherson wrote: 'The late Governor General was a great encourager of the introduction of new articles of commerce and foreign production into these Provinces, and I regretted very much that the state of the Company's finances prevented our purchase for them of his garden, in which these plants were reared.'

250 kilometres south of Madras. One of them, Johann Koenig, was a pupil of Linnaeus. He arrived in 1768, and his interest in natural history led to a post as Naturalist to the East India Company being created for him in 1778.²⁴ Koenig died in 1785, but during his time as a naturalist he was able to lay the foundations of systematic botany in south India. The post of Company Naturalist was continued, and held successively by the surgeons Patrick Russell and William Roxburgh.²⁵ Roxburgh was previously based at Samulcottah, some 320 kilometres north of Madras. He set up a small experimental garden there, and gained a reputation as the most promising British botanist in the region. Koenig, Russell and Roxburgh were all correspondents of Sir Joseph Banks, who enthusiastically encouraged their researches.

By the later 1780s there was a climate sympathetic to more focused botanical investigations into the plant life of India, and a willingness by the East India Company to spend some money on facilitating these investigations. Consequently, there was a favourable response in both Calcutta and London when Lt. Colonel Robert Kyd, the Secretary to Military Board of Inspection, suggested in 1786 that the Company should establish a botanic garden in Calcutta. Kyd made it clear that he envisaged an acclimatisation garden whose prime purpose would be the introduction of economic and famine crops.²⁶ The East India Company in London did warn the Bengal Government not to let expenses get out of control, but the Directors still said: 'But so sensible are we of the vast importance of the objects in view, that it is by no means our intention to restrict in point of expense in the pursuit of it.'²⁷

There were several factors behind this positive response to Kyd's proposals. Richard Grove has pointed out that even before Kyd's initiative there had been a proposal that there should be an exchange of plants between Calcutta and the botanic garden at St Vincent in the West Indies.²⁸ This was also a time of growing intellectual curiosity about India. Sir William Jones had founded the Asiatic Society of Bengal two years earlier, in 1784, and the first issue of its journal *Asiatic Researches* was about

²⁴ Burkill, *Chapters on the History of Botany*, 12.

²⁵ Ibid., 13.

²⁶ British Library, India Office Records (hereafter BL IOR) H/799, 10. Letter of 1st June, 1786 from Lt. Col. Robert Kyd to the Governor General and Council.

²⁷ BL IOR H/799, 41: Letter of 31st July 1787 from Court of Directors to Government of Bengal.

²⁸ Grove, *Green Imperialism*, 335-6.

to be published. His proposed programme of investigation was to inquire into ‘Man and Nature: whatever is performed by the one or produced by the other’²⁹, and botany formed an important part of that project.³⁰ When Kyd made his proposal, the overall finances of the East India Company were recovering because of the growth of the tea trade with China.³¹ At the same time, for political reasons, the Company wanted to improve its image in Britain. It therefore suited the Company to accede to Kyd’s argument that the British had a duty to counter the effects of famines in India.³²

Sir Joseph Banks backed Kyd’s proposal on economic grounds.³³ It fitted in well with Banks’s emerging strategy to support British production and trade by establishing a network of botanic gardens.³⁴ The British had already set up a Caribbean garden on St Vincent in 1765, and had taken note of the success of the French garden on the Île de France (now Mauritius).³⁵ When asked for advice by the East India Company, Banks responded with great enthusiasm:

.... let all honor be given to Col Kyd, by whose means benefits of such importance will speedily be conferred on 20 millions of people in a manner which will secure them to their latest posterity, who will wonder their ancestors were able to exist without them, & revere the name of their British Conquerors to whom they will be indebted for the abolition of Famine, the most severe scourge with which providence had afflicted them.³⁶

Banks also saw the wider economic potential of plant exchange:

‘Laborers (*sic*) are abundant there (*in India*): labor excessive cheap; raw material of many sorts, dying drugs, medicines, spices, etc sure of a ready and advantageous market and of producing a most beneficial influence upon the commerce of the mother country: why then should not raw materials of every kind which the

²⁹ *Asiatick Researches*, I, 1788, xii-xiii.

³⁰ Zaheer Baber, *The Science of Empire* (Albany, 1996), 156.

³¹ As the result of a drastic reduction on the tax on tea in 1784, tea sales at India House in London rose from 6,500,000 lbs in 1784 to 16 million lbs in 1786 - see C H Philips *The East India Company, 1784 - 1834* (Manchester, 1961), 82.

³² See P J Marshall, *Problems of Empire, 1757-1813* (London, 1968), 85.

³³ Natural History Museum, London. Dawson Turner Correspondence (hereafter NHM DTC), Vol. V, f.184. Banks to Henry Dundas, 15th June 1787.

³⁴ David Miller, *Visions of Empire: Voyages, Botany and Representations of Nature* (Cambridge, 1996), Introduction.

³⁵ Drayton, *Nature’s Government*, 79.

³⁶ DTC Vol V ff.184-189, Banks to Henry Dundas, 15th June 1787.

intertropical countries furnish, except perhaps sugar, be sent to us from the East Indies cheaper than they can from the West.³⁷

Banks's particular contribution was to provide a vision of how botanic gardens in India could contribute to a worldwide system. The East India Company had no comparable vision, so he was a powerful influence on the development of Calcutta Botanic Garden. Banks's power was based on his accumulation of well-organised plant material and books in London, but it would be premature to call his house a 'centre of calculation' as it was personal rather than institution based, and ceased to be important once he died.³⁸

Although he only lived for seven years after he was authorised to set up the Botanic Garden in 1786, Kyd's decisions powerfully shaped its future. He determined its size, and his introduction of the term 'botanic garden'³⁹ implied a garden comparable to those at Kew and St Vincent, with a clear purpose and official sponsorship. He made sure that the Council in Calcutta took a continuing interest in the Garden's progress,⁴⁰ and that high-level involvement continued well into the nineteenth century. Kyd's death in 1793 provided an opportunity for the East India Company to evaluate what had been achieved, but there is no evidence of any hesitation about proceeding with the venture.

The Directors had on several occasions expressed their satisfaction with Kyd's efforts,⁴¹ but he was not a botanist. It was therefore decided that Kyd's successor should be a qualified botanist with expertise in identifying, recording, propagating, and transporting plants. By that time William Roxburgh offered all those skills and had over ten years' experience so he was quickly appointed.⁴² Under his charge the Calcutta Garden became one of the first effectively organised colonial scientific institutions established outside America. It acquired a high profile and attracted the

³⁷ DTC Vol V ff.159-166, Banks to Sir George Yonge, 15th May 1787.

³⁸ Miller, 'Joseph Banks, Empire, and "centres of calculation" in late Hanoverian London' in *Visions of Empire*, 23.

³⁹ BL IOR H/799, 10. Kyd's letter of 1st June, 1786 to the Governor General and Council.

⁴⁰ BL IOR H/799, 29-184.

⁴¹ BL IOR Letter to Court of Directors, 25th Nov 1791, para 52.

⁴² The appointment was very swift: Kyd died on 26th May 1793 and there is evidence that Roxburgh already knew that he would be offered the post in early June – see letter from Andrew Ross to Roxburgh, 16th June 1793, Natural History Museum, Botany Library, Roxburgh Correspondence, quoted in Robinson, *William Roxburgh*, 41.

interest of senior British officials. Most of the early governors general visited, and it featured in various published accounts. It was prominently sited and regarded as an asset and an adornment to Calcutta.

William Roxburgh and his immediate successors, 1793-1817

Roxburgh's appointment was noteworthy for other reasons too. Firstly it was decided to make the post of superintendent full time. Kyd himself had been paid as Military Secretary, but by prior arrangement that post was abolished when he died.⁴³ The Council in Calcutta used his former salary of Rs.1,500 per month to fund the new full-time Superintendent post. It continued to be paid at that same generous rate for over a hundred years. Roxburgh's appointment also reflected the Garden's changing orientation:

The conduct of affairs new under Roxburgh diverged so from the proposals of Kyd's first letter as to suggest that the adjective 'botanical' in Kyd's [original] name [for the Garden] had driven botany into the administration actually during Kyd's years of control so that at the date of Kyd's death it was a natural thing to call in a botanist.⁴⁴

The East India Company's employment of Roxburgh, and later Wallich, established a tradition of employing professional scientists attached to institutions in India. Although the Company had already employed people in what could be called scientific roles,⁴⁵ they had not had a publicly funded institutional base.

In his work at the Garden, Roxburgh introduced a scientific approach to problem solving, proceeding by experiment, measurement and careful record keeping.⁴⁶ During the following twenty years he worked on economic crops, but he also continued the botanical project to catalogue and classify the flora that he had started in southern India. Gradually he added to the 300 species that Kyd had introduced to the Garden, so that when he left in 1813 there were 3,500.⁴⁷ He was allowed to do that because it suited the East India Company to be seen as a patron of scientific

⁴³ See B.B. Misra, *The Central Administration of the East India Company, 1773-1834* (Manchester 1959), 77.

⁴⁴ Burkill, *Chapters on the History of Botany*, 103.

⁴⁵ Such as James Rennell, appointed the Company's first Surveyor-General in 1767 (see Arnold, *Science, Technology and Medicine*, 40).

⁴⁶ Robinson, *William Roxburgh*, 109-111.

⁴⁷ Roxburgh, *Hortus Bengalensis* (Serampore, 1814), introduction by William Carey, ii.

activities, in order to suggest that the Company's rule contributed to the greater good of mankind.⁴⁸

Subsequent superintendents continued Roxburgh's project to investigate and classify the flora, as they generally found scientific enquiries more interesting than acting as nurserymen for economically valuable plants.⁴⁹ Their investigations required a flow of plants. Sometimes they did the collecting themselves, but they also relied on Garden staff,⁵⁰ specialist collectors, and interested amateurs, who were often up-country surgeons and underemployed military officers.⁵¹ The Garden received some of the proceeds of official surveys, notably those of Buchanan in Bengal.⁵² The aim of such surveys was to help India's new British rulers feel that they 'knew' their newly acquired territory, and therefore enable them to "govern", and perhaps "develop" it, better than their predecessors.⁵³ In practice, however, European efforts to describe India were often less accurate than officials thought at the time.⁵⁴

Once the specimens collected reached the Botanic Garden they had to be classified and recorded.⁵⁵ The superintendents deployed their scientific skills to understand the plants they received. Practice was important too, and often the superintendents had to dissect the plant's parts and examine them under a microscope. After that, the plant could be classified, assigned to a genus and recorded. Successful classification generally depended on access to a good library and a properly organised and labelled herbarium, particularly if there was a query as to whether the plant had been collected in India before.⁵⁶ However, a new identification was of little use unless the knowledge was disseminated. That usually involved sending botanical material, which

⁴⁸ Drayton, *Nature's Government*, 116.

⁴⁹ Ambitious superintendents also needed to do some scientific work as a basis for publication. Only in that way could they establish their botanical reputation and get elected to learned societies – see, for instance, Thomas Anderson's worries about his publishing record in RBG Kew DC 155: Anderson to Joseph Hooker, 8th January 1867.

⁵⁰ Sometimes the superintendents of the Garden were collectors themselves. In 1821-22 Nathaniel Wallich spent over a year in Nepal purely to investigate the flora and collect plants.

⁵¹ Officers sometimes collected officially: William Griffith, for instance, was appointed 'Naturalist to the Army of the Indus' in 1839 – see Desmond, *European discovery of the Indian Flora*, 115.

⁵² Marika Vicziany, 'Imperialism, Botany and Statistics in Early Nineteenth-Century India: The Surveys of Francis Buchanan (1792-1829)', *Modern Asian Studies*, 20 (1986), 625-.

⁵³ Arnold, *Science, Technology and Medicine*, 22-23.

⁵⁴ See for instance Edney, *Mapping an Empire*.

⁵⁵ Endersby, *Imperial Nature*, 137-47.

⁵⁶ *Ibid.*, 150.

could include live plants, seeds, herbarium specimens and drawings to fellow botanists. Once the identification was confirmed, the final stage was publication, either in books or journal articles.⁵⁷ As these practices were established under Roxburgh, Calcutta Botanic Garden became a complex institution with nurseries, a herbarium, studios for artists and painters, storehouses to sort, pack and distribute plants, and an office to keep track of all the activity. All these people needed to work collaboratively: as Kapil Raj has put it, ‘...the kinds of knowledge discussed in this essay could only be constructed and sustained within a strong framework of formalised institutions with their imperatives of teamwork and a stratified division of labour.’⁵⁸

One of Roxburgh’s most important contributions was to provide a period of stability and consolidation for the newly founded Botanic Garden. During the twenty years that he was Superintendent the word “science” was used increasingly in accounts of the Garden. As early as 1791 Kyd himself had said, ‘as the pursuits of the Supervisor of your Botanical Garden are not for his individual gratification but have a commendable tendency to the promotion of Science, as well as of the National Interest...’⁵⁹ In the same year Banks wrote to say that his views on the development of the Garden remained the same, ‘- provided I am right in thinking Calcutta Botanic Garden is intended solely for the promotion of public utility and science...’⁶⁰ It has been suggested that Banks was becoming increasingly confident in making his scientific motives clear at this time,⁶¹ and in 1804 his opinion was supported by Wellesley, the Governor General, who wrote, ‘...to facilitate and promote all enquiries which may be calculated to enlarge the boundaries of general science is a duty imposed on the British Government in India by its present exalted situation.’⁶²

⁵⁷ Ibid., 195-208.

⁵⁸ Kapil Raj, ‘Colonial Encounters and the Forging of New Knowledge: Great Britain and India 1760-1850’, in Roy Macleod, *Nature and Empire: Science and the Colonial Enterprise*, *Osiris*, 2nd series (Chicago, 2000).

⁵⁹ BL IOR, Letter from Bengal to Court of Directors, 12th March 1791, para 27.

⁶⁰ DTC Vol VII ff. 303-5: Banks to unidentified correspondent, 17th January 1791.

⁶¹ Grove, *Green Imperialism*, 338.

⁶² Quoted by Mildred Archer in ‘India and Natural History: the Role of the East India Company, 1785-1858’ in *History Today* Vol IX, p.738 (1959).

Roxburgh did also work on a wide variety of economic crops. He helped to make indigo and, for a short time, cochineal dye, viable Indian exports.⁶³ He worked on fibres such as hemp, and jute,⁶⁴ and successfully grew cinnamon and pimento, though they did not succeed as commercial crops.⁶⁵ He also built on Kyd's initial links. Apart from contact with colleagues all over India, he was in touch with many people in Britain with botanical interests. Despite the Napoleonic wars, his contacts also extended to some of the leading French botanists of the time, and to the Americas.⁶⁶ Under Roxburgh the beginnings of a network can be seen, with the Calcutta Garden exchanging plants and information with a number of separate institutions, and not simply conveying information to the metropolis.

Roxburgh's collecting and sorting practices meant that the Botanic Garden began to emerge as a 'centre of calculation' too. He passed on the information he collected, and wrote some thirty-five articles for scientific and technical journals in London and Calcutta.⁶⁷ Roxburgh's work also resulted in three important books. The first was *Plants of the Coast of Coromandel*, published in Britain in three volumes in 1798, 1805 and 1820.⁶⁸ Each volume contained one hundred plates, drawn by Roxburgh's Indian artists. Roxburgh also kept a careful list of the plants growing in the Botanic Garden, and passed this to William Carey⁶⁹ in 1812. Carey published the list in two volumes in 1814 under the title *Hortus Bengalensis*. We thus have an accurate and useful account of the 3,500 species in the Botanic Garden when Roxburgh left. Even more important was Roxburgh's *Flora Indica* published partially by Carey in 1820 and 1824, and then in a full version in 1832. In that work Roxburgh gave fuller descriptions of nearly 2,000 species.⁷⁰ The *Flora Indica* was for many years the only general guide to the Indian flora, and was re-published in a more compact form as late as 1874 (see Chapter Four).

⁶³ Robinson, *William Roxburgh*, 143-151.

⁶⁴ *Ibid.*, 153-6.

⁶⁵ *Ibid.*, 168-78.

⁶⁶ *Ibid.*, 109, 117.

⁶⁷ *Ibid.*, 221.

⁶⁸ For details of the long and complicated publishing history of *Plants of the Coast of Coromandel*, see Desmond, *European Discovery of the India Flora*, 48-50.

⁶⁹ See Chapter One for Carey's background.

⁷⁰ For a detailed account of these publications see Khyati Nagar, 'Between Calcutta and Kew: The Divergent Circulation and Production of *Hortus Bengalensis* and *Flora Indica*' in Lightman, Bernard, McQuat, Gordon and Stewart, Larry (eds.), *The Circulation of Knowledge Between Britain, India and China: The Early-Modern World to the Twentieth Century* (Brill 2013).

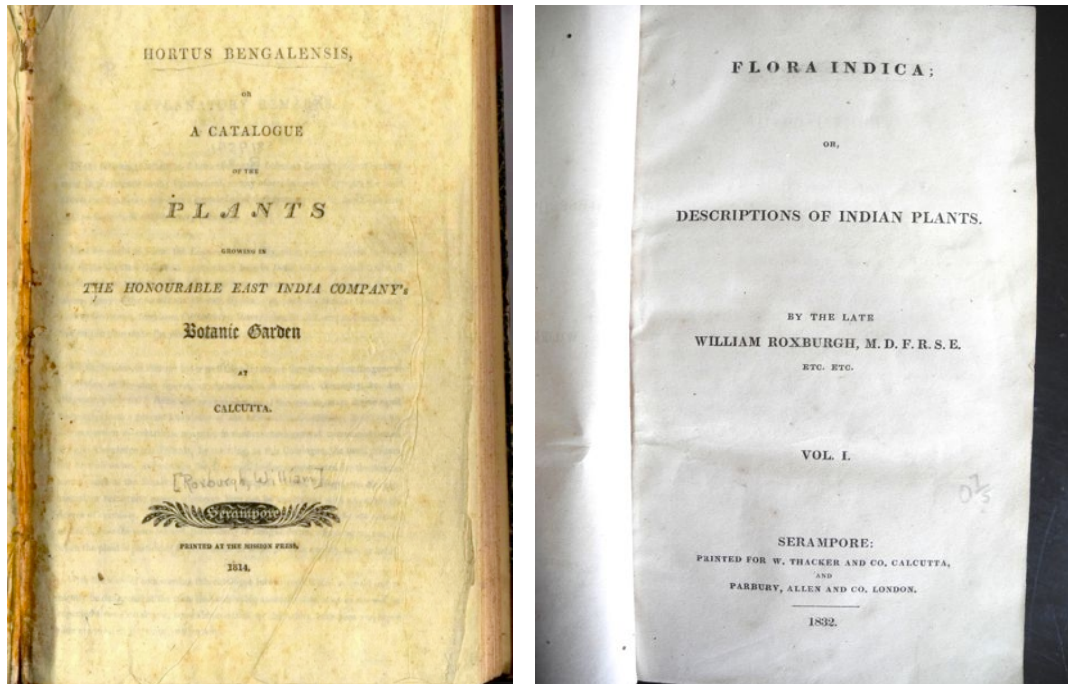


Figure 6. Carey's editions of Roxburgh's *Hortus Bengalensis* (1814) and *Flora Indica* (1832).

By the time of his departure Roxburgh had transformed the work of the Botanic Garden, and he merited the title 'father of Indian botany' that his successors gave him.⁷¹ He had fashioned a team of skilled gardeners, artists and clerks, and built up a herbarium and collection of books and drawings. Many of the traditions and conventions he established at the Botanic Garden lasted for the next hundred years. Senior Company officials had come to see botanical investigations as an important part of their project to know India, and did not query the Garden's existence when Roxburgh left.

Roxburgh's strong institutional legacy was, however, severely tested during the four years after his departure. There was no general agreement on a successor, and five different officials and surgeons acted as superintendent before the situation was resolved in 1817. That was partly the result of illnesses and retirements, but also involved patronage and the control of scientific material, demonstrating that there

⁷¹ George King, 'A Brief Memoir of William Roxburgh', *Annals of the Royal Botanic Garden, Calcutta*, 5 (1895), 3.

were continuing disputes about the role of scientists. As the superintendent's post was one of the best-paid open to members of the Indian Medical Service, appointments had to be confirmed by the Court of Directors. But given the slow communications at the time, the Governor General was empowered to appoint people temporarily, and also to take decisions on the poorly defined issue of who owned the plant collections, books and drawings at the Botanic Garden.

Initially Henry Thomas Colebrooke⁷² managed the Garden when Roxburgh left in 1813.⁷³ However, Colebrooke himself had decided to retire to Britain in 1814, so the post of Superintendent needed to be filled substantively. Francis Buchanan was then appointed. He took up the post in November 1814, but resigned three months later, when he heard that he had inherited an estate in Scotland.⁷⁴ Buchanan's temporary successor was Nathaniel Wallich, a twenty-nine year old surgeon of Danish origin, who had assisted Roxburgh and established a reputation as a dedicated botanist.⁷⁵ However, he was replaced in April 1816 by a more senior surgeon, James Hare. Hare did not stay long as illness forced him to resign in November 1816. Wallich was the obvious candidate to replace Hare, but he had offended the Governor General, Lord Moira, who decided to appoint yet another surgeon, Thomas Casey.⁷⁶ Casey was not known as a botanist so there was then serious concern that the Garden might decline and become little more than a decorative park.

The person who challenged the Governor General's decision and articulated the concerns of those who wanted the Botanic Garden to continue as a serious scientific centre was William Carey. Carey was by that time a highly respected figure in Calcutta, and knew Wallich well from their time together in Serampore.⁷⁷ Carey wrote to Colebrooke and to John Fleming, the recently retired Surgeon General in Bengal, who were both influential figures in London by this time. They warned Sir Joseph Banks of the threat to the future of the Garden and the Court of Directors was

⁷² Henry Thomas Colebrooke (1765-1837) was a senior East India Company official, judge, scholar and amateur botanist. He was a member of the governing Council in Calcutta from 1807 until he left India in 1814.

⁷³ Desmond, *European Discovery of the Indian Flora*, 66.

⁷⁴ *Ibid.*, 78-79.

⁷⁵ Robinson, *William Roxburgh*, 62.

⁷⁶ Desmond, *European Discovery of the Indian Flora*, 82.

⁷⁷ In the eighteenth century several European trading companies had bases on the River Hooghly. Serampore remained under Danish control until it was bought by the East India Company in 1845.

persuaded to over-rule the Governor General.⁷⁸ Colebrooke favoured sending out a qualified naturalist from Britain, but since no one was available, it was agreed that Wallich should once more be appointed.⁷⁹ The Court of Directors endorsed this in January 1817.⁸⁰

A dispute about drawings complicated these various manoeuvres. When he left at the beginning of 1815 Buchanan was angry that the Council in Calcutta would not allow him to take back to Britain the drawings he had prepared as part of his survey. The Directors in London supported Buchanan's protest and instructed the Government in Calcutta to send the drawings to Britain. James Hare, who had by that time taken over at the Garden, protested vocally that releasing all the drawings would mean that 'every trace of natural history in India would have been blotted out'.⁸¹ Hare's solution was to copy the drawings so that a set would be retained in Calcutta, which led to an argument with Wallich who thought that the copying methods were damaging the originals.⁸² It is easy to see these disputes over paintings as petty squabbles, but behind them were major issues about the autonomy of the Garden, and the extent to which it would be a subsidiary centre in the global network. India was more 'modern' than Britain in employing paid naturalists,⁸³ but it meant that they had to accept that they did not have an automatic right to retain their specimens and drawings. Secondly, if the tradition of appointing a qualified naturalist to the Superintendent post was to continue, then Calcutta would become a 'centre of calculation' in its own right. If it did, it would need the accompanying apparatus of a herbarium, drawings and books.

These conflicts would recur. Between 1815 and 1817 the Company clearly had difficulty in deciding what role the Garden should have in the future, and it was only Banks, and those like Carey who shared his vision, who was able to ensure that it would continue on the course Roxburgh had set. However, Banks was an old man by

⁷⁸ Desmond, *European Discovery of the Indian Flora*, 83.

⁷⁹ Colebrooke to Carey, 6th January 1817. This and two other letters dated 13th and 30th January 1817, held at the Royal Asiatic Society in London, from Colebrooke in Hampstead to Carey in Calcutta give the story of how this decision was taken.

⁸⁰ Colebrooke to Carey, 30th January 1817.

⁸¹ BL F/4/559 item 13709: Hare to Government of Bengal, 27th July 1816.

⁸² Desmond, *European Discovery of the Indian Flora*, 83.

⁸³ Britain had no equivalent of the Indian Medical Service at this time, and the British Government employed very few scientifically qualified people outside the Army and Navy.

that time, and his death in 1820 exposed the drawbacks of excessive reliance on an influential and dominant patron. The reaction against such situations meant that there was a gradual move away from patronage, both in Britain and in India, and the beginnings of a belief in the need for self-sustaining professional institutions.⁸⁴

Nathaniel Wallich's early years as Superintendent, 1817-1828

Wallich was relatively young and inexperienced when he was appointed, as well as being something of an outsider. He did not arrive with a clear agenda of his own as Roxburgh had, and tended at first to respond to the guidance of others. By 1820, however, he was ready to take the initiative and requested permission to go to Nepal, where he spent over a year making an important collection. Like most of the superintendents, Wallich believed that his main task was to investigate and classify the Indian flora as part of the worldwide Linnaean project.⁸⁵ Despite that, his contribution to knowledge formation was different to Roxburgh's. Roxburgh has rightly been described as a 'stationary' superintendent.⁸⁶ In contrast, Wallich can be seen as having a mobile vision of his science. Not only was he mobile himself, but he did not see his collections as being fixed in one place either – hence his willingness to move his entire herbarium to London. Table 2 below shows just how active he was as a collector, and how much time he spent away from his base:

Table 3. Times when Wallich was absent from Calcutta, 1817-33

Dates	Location	Number of months absent	Total absence
July 1820 - Nov 1821	Nepal	17 months	
Aug-Dec 1822	Penang and Singapore	5 months	
Jun 1824 - Apr 1825	Burma	10 months	
1826	Oudh and Rohilkhand	8 months	
1817-28	Total Absence during		40 months

⁸⁴ Richard Holmes, *Age of Wonder* (London, 2008), 395-6.

⁸⁵ Wallich was taught by two Danish followers of Linnaeus, Martin Vahl (1749-1804), and J. W. Hornemann (1770-1841) – see Desmond, *European Discovery of the Indian Flora*, 81.

⁸⁶ Mukherjee, Abhijit, 'Natural Science in Colonial Context: the Calcutta Botanic Garden and the Agricultural Society of India, 1787-1870', unpublished Ph D thesis, Jadavpur University, Kolkata 1996.

	first 10½ years		(3½ years)
Feb 1828 – Mar 1833	Leave in Britain		61 months (5 years)
1817-33	Total absence during first 15½ years		101 Months (8½ years)

This shows that Wallich was only in Calcutta for a total of seven years in the period 1817-1833, so he had much less time than it might have seemed to work on tasks requiring his presence in Calcutta, such as organising the herbarium and experimenting with economic crops.

Wallich willingly made these collecting trips because he was aware of the importance of maintaining the favour of his superiors. In some cases he was following closely on the heels of victorious British armies. As he well understood, his task was to assess the newly revealed botanical ‘riches’ and ‘spoils.’⁸⁷ They included not only what might be valuable (particularly timber), but also trees and horticultural novelties such as azaleas, rhododendrons and orchids to embellish the estates and newly built hothouses of influential British landowners. Although he did much of the work himself, Wallich was assisted by a number of other European and Indian collectors. Given his long absences he also relied heavily on the support of his Garden staff, including his nurseryman, George Potter, his office manager, Womanund Dutt, his head gardener, Kurrim Khan, and the head of the nursery, Shaik Mooty, of whom he wrote: ‘The knowledge of the treatment and cultivation of plants, his acquaintance with the Linnaean system, and what is more surprising, with the natural classification are such as would do honor to any European gardener.’⁸⁸ There will be further examples of this mutual constitution of knowledge in later chapters.

Wallich built on the networks that Roxburgh had developed, but was an even more assiduous correspondent. His work and reputation were both anchored in his correspondence with other botanists, in an era when many had no properly established institution to support their work. Wallich got letters from most of the other distinguished British botanists, including Robert Graham, Professor of Botany

⁸⁷ See Arnold, *Tropics and the Travelling Gaze*.

⁸⁸ BL IOR F/4/655 Item 18040. Wallich to Government of Bengal, 14 June 1820, quoted in Desmond, *European Discovery of the Indian Flora*, 85.

at Edinburgh, Walker Arnott, later to be William Hooker's successor at Glasgow, John Lindley, Professor at University College, London, A B Lambert and Robert Brown at the British Museum. Although Wallich was testy at times,⁸⁹ he made good and lasting friendships with other botanists including Carey himself and William Hooker, his most regular and valuable British correspondent.⁹⁰ Wallich displayed diplomatic skills in dealing with the Agri-Horticultural Society,⁹¹ and with the botanic garden at Saharanpur, where he maintained good relations with J. Forbes Royle (1823-31), the first superintendent.

Like Roxburgh, Wallich regarded publicising the results of his collecting as a priority, but he had little time to write up his work. Even so, he did manage to produce the illustrated *Tentamen florum Nepalensis illustratae*, published in Calcutta in 1824. This was an important contribution to knowledge of the then little-known Himalayan flora. In addition, Wallich found time to assist Carey in publishing the first parts of Roxburgh's *Flora Indica*.⁹²

All his collecting meant that Wallich had accumulated a very large herbarium by 1828. What he lacked was the time to sort and arrange all his specimens, and to describe them for the benefit of other botanists. This highlights the early colonial scientists' dilemma of whether to try to become a 'centre of calculation'.⁹³ When he was allowed to go on leave in 1828 Wallich took the momentous decision to transport the Garden's entire herbarium collection and drawings to Europe. His proposal, approved by the Government in Calcutta, was to have long-term implications. Wallich gave a clear account of why he took the action he did in 1828, and it is worth quoting him at length:

My time has been so much occupied by the immediate business of the Garden, that my Scientific pursuits have continually suffered interruptions. I have hitherto only been able to gather materials having had time to publish but little of the immense Stores which have been accumulated from the sources described in a preceding part of this letter. Indeed it would scarcely be possible for any person

⁸⁹ BL Eur MSS B230. See Carey's comments to H. T. Colebrooke, 14 June 1817, quoted in Desmond, *The European Discovery of the Indian Flora*, 82.

⁹⁰ See RBG Kew: Wallich's letters of 2nd September and 13th October 1818 to William Hooker.

⁹¹ Dudeja (ed.), *In Full Bloom*, 6.

⁹² Desmond, *European Discovery of the Indian Flora*, 68-9.

⁹³ Latour, *Science in Action*, 229.

to do justice to such treasures without having an opportunity of consulting personally those eminent men, whose verbal advice and suggestions would be of more value in that respect than any Botanical Library however rich and well selected.

I have by me the manuscript account of several thousand Plants, made principally during my various journeys which I am naturally anxious to put into a form that will enable me to submit them to the opinion of the Scientific World. But it is next to impossible to do this effectually or satisfactorily in this Country, debarred as it is from all the Literary advantages, which abound in Europe.⁹⁴

Wallich went on to explain that he needed assistance in order to engrave for publication the drawings that had been produced at the Botanic Garden, because of the poor standard of engraving in India. He then summed up the main purposes of his visit:

To be enabled to publish the most remarkable of those drawings, and to put into proper shape the materials which I have heaped together for so many years; to have an opportunity of conversing with those eminent men who take the lead in the Science of Botany, Horticulture and Rural Economy; to keep in some degree pace with the yearly accelerated march of Science from which I have been distanced by an absence from Europe of twenty years requires that restoration to health and those opportunities which a voyage to Europe only can effect.⁹⁵

But we have to note another reason for Wallich's actions. European botanists and aristocrats with interests in landscaping and gardening were eager for novelties from the east. They were happy to meet Wallich, and he in his turn was much gratified by such signs of his acceptance into British society.⁹⁶ As is evident in the first of these extracts, he felt proud to be conveying 'immense stores' and 'treasures', thus making the riches of India available in Europe.⁹⁷

Conclusion

By the time Wallich went on leave in 1828, the Botanic Garden had been in existence for just over forty years. It had become firmly established in Calcutta, and had developed the characteristics of a scientific institution. It had experimented with many plants, and developed significant knowledge of the Indian flora. However, it

⁹⁴ BL IOR F/4/961 No.27345. Wallich to E. Moloney, Acting Secretary, Government of Bengal, 5th November 1827.

⁹⁵ Ibid.

⁹⁶ RBG Kew DC 52, Wallich to William Hooker, 17th March 1831.

⁹⁷ Arnold, *Tropics and the Travelling Gaze*, 154.

had not succeeded in introducing any important economic crop. With his work on fibre producing plants, spices and sugar, Roxburgh had gained a reputation for interest and ability in the field. But Wallich's constant travelling and collecting had left less time for such experiments. Apart from his work on forestry, particularly teak, he had to a large extent left economic botany to the Agri-Horticultural Society. The Garden's main achievement during this period was therefore to build up a huge collection of plant material. In 1828 it had a very large herbarium by the standards of the time.

Wallich worked extremely hard whilst he was on leave, sorting his collections and publishing a major work, the *Plantae Asiaticae rariores* (London, 1830-32).⁹⁸ With 294 plates, based on drawings and paintings by the Garden's talented artists Gorachand and Vishnu Prasad,⁹⁹ this work compared with Roxburgh's *Plants of the Coast of Coromandel*, but was produced far more expeditiously and efficiently.¹⁰⁰ However, it included only the more attractive or spectacular of the plants that Wallich had collected.¹⁰¹ Wallich also ensured that the herbarium he brought back to Britain was examined by appropriate experts, and he thus contributed a great deal to European knowledge of the Asian flora. His suggestions about the importance of his collection turned out to be justified:

It would ill become me to intrude any observation on the extent and value of the collections which have been sent home; but I humbly trust that the result of their examination will prove to your Honble Court that the support which has been granted to the Honble Company's Botanic Garden at Calcutta has produced every anticipated benefit, both as regards the improvement of the Nature of India, and as enabling the Government to appreciate the value and importance of such an Establishment by developing the vast resource of the Indian Empire in matters connected with the arts and sciences with agriculture and commerce.¹⁰²

⁹⁸ This three-volume work was beautifully produced in London, but was immensely expensive at £10 per volume (at least £1,000 in terms of 2013 prices), so it would only have been available in the libraries of rich people and the better-endowed learned societies.

⁹⁹ These artists continued to work for Wallich in the 1830s, but no systematic use was made of the paintings they produced during that period.

¹⁰⁰ Desmond, *European Discovery of the Indian Flora*, 89-90.

¹⁰¹ See Anne Secord, 'Botany on a Plate: Pleasure and the Power of Pictures in Promoting early Nineteenth Century Scientific Knowledge,' *Isis* 93 (2002) no.1: 28-57, for an illuminating account of the debate about the function of illustrations in popularizing botany in the early nineteenth century.

¹⁰² BL IOR F/4/961, 13 No. 27345, Wallich to Court of Directors, 29th July 1828.

The problem was that by not making sure that duplicate specimens and drawings remained in Calcutta, Wallich gravely weakened the Garden as a 'centre of calculation', and hence made it very difficult for serious botanical work to continue in India. The concept of an official scientific institution was still in its infancy at this time, and Roxburgh and Wallich were allowed a good deal of freedom in running the Botanic Garden. They started to build it up as a rule-based, hierarchical structure, but Wallich did not fully appreciate the coming importance of accountable institutions, dependent on permanent collections and resources.

In its early days the Garden had benefitted greatly from the support of influential people in Britain. However, after the death of Sir Joseph Banks in 1820 there was a decline in official British backing for investigatory and scientific enterprises overseas.¹⁰³ Wallich tried to guarantee the Garden's future by making sure that it was well connected. He wisely built on the links with the botanists in Scotland that were originally established by Roxburgh. He also engaged the interest of the governors general of the period, by devices such as naming his prize find in Burma, *Amberstia nobilis*, after Lord Amherst's wife. The contacts that Wallich made all over Europe in 1828-32 were similarly valuable in ensuring that there was enough backing for the Garden to survive, albeit with a reduced budget, after Lord Bentinck's retrenchment in 1829. Wallich also started to develop a collaborative network in India, with links to the other leading botanists and natural historians of the time, including General Hardwicke, Brian Hodgson in Kathmandu, Robert Wight in south India and Forbes Royle at Saharanpur.

Wallich can be seen as a transitional figure, spanning the change between the early nineteenth century, when the European élite in Calcutta knew each other well, and support and loyalty to colleagues could be as important as adherence to rules, and the much more rigid and complex administration of the mid and late nineteenth century. That new structure included clearer rules about the ownership of scientific material accumulated in India, and none of the superintendents after the 1850s would have been able to behave as Wallich did with the herbarium in 1828.¹⁰⁴ In sum, he ultimately acted as an instrument of the European botanical establishment, and gave

¹⁰³ Drayton, *Nature's Government*, 129-30.

¹⁰⁴ Desmond, *European Discovery of the Indian Flora*, 88-89.

too little thought to the future of the Botanic Garden as a scientific institution. His successors came with a different attitude to knowledge formation in India. As a result, Wallich was justly praised by his contemporaries, but not by his successors in Calcutta, and it was thirty years before the Garden was again able to function as a 'centre of calculation' in its own right.

Chapter Three

Inertia, experiment and the restoration of a scientific capability, 1833-71

Creating ‘a working scientific establishment’

In November 1862 Thomas Anderson, the Superintendent of the Botanic Garden from 1861-69, wrote to Joseph Hooker at Kew, describing how he was arranging botanical order beds, landscaping the Garden, writing a catalogue of what was growing there, retrieving library books for binding, and gluing down herbarium specimens. He concluded: ‘When these are finished I can begin to make use of the Gardens, Library and Herbarium as a working scientific establishment.’¹

This chapter focuses on the different ways in which Anderson’s predecessors had understood the scientific role of the Garden, and considers why he did not regard it as ‘a working scientific establishment’ in 1862. It argues that Anderson represented a newer and more systematic approach to the processing of scientific knowledge. He was specific in wanting a botanic garden that could act as a proper reference point for leading the investigation of the Indian flora, and for teaching botany. He was laying the groundwork for the Calcutta Garden as a ‘centre of calculation’ its own right, as it had started to be in Roxburgh’s time.

Anderson was strongly influenced by the Hookers and their work at Kew. He shared their views on the importance of thorough and detailed botanical work. But he also believed that as much as possible of the analysis and publication of botanical information should be done in India rather in Britain; only that would provide a professionally rewarding career. It had taken longer than expected to recreate the Garden as ‘a working scientific establishment’, and the difficulties faced after 1833 in restoring the Garden’s scientific capability will be the main theme of this chapter.

¹ RBG Kew Archives DC 155 Indian letters: Anderson to Joseph Hooker, 23rd November 1862.

More broadly, the chapter will consider changes in the Garden's relationship with the East India Company and Government of India, and with the emerging botanical profession in Britain, and how well the Garden was able to meet their expectations. Much changed during this period. The area of India controlled by Britain expanded substantially,² increasing the scope for botanical investigation. The uprising of 1857 caused major changes in the way that Britain governed India. The ending of East India Company rule in 1858 led to a stronger emphasis on direct accountability.³ At the same time, the rise of Kew Gardens as an organisation that aimed to coordinate British botanical work worldwide had an important impact.⁴

The Garden also had to adapt to major changes in the way science was viewed and practised. Nathaniel Wallich, who continued as Superintendent until 1846, had first arrived in India in 1807, and had been at the Botanic Garden since 1815.⁵ He owed his position in India to influential patrons who had recognised his talent and commitment.⁶ He retained that position by meeting the wishes and expectations of senior officials of the East India Company, and of influential figures in British science and society.⁷ He also conducted a very wide correspondence, and used that to defend vigorously his own conduct and interests. The botanists who succeeded Wallich were brought up with different expectations. They had been taught the new natural system of classification and had a better understanding of relationships between plants.⁸ Botany had also gradually become more of a profession, with its own institutions and publications,⁹ and professional journals were replacing letter writing as a way of communicating botanical information.¹⁰

² Much of Northwest India came under British control in the 1840s, including Sind and the Sikh states, and Southern Burma was ceded after a war in the 1850s.

³ Edward Thompson and G. T. Garratt, *The Rise and Fulfilment of British Rule in India*, (London, 1934), 480.

⁴ Drayton, *Nature's Government*, 247-48.

⁵ He was the longest serving superintendent the Garden has ever had.

⁶ Arnold, 'Plant Capitalism and Company Science,' 905-07.

⁷ Initially Sir Joseph Banks, but later, aristocrats with botanical interests as well as leading figures in the learned societies.

⁸ Endersby, *Imperial Nature*, 173-78.

⁹ During this period, provincial towns were setting up their own botanic gardens, botanical societies were being founded and a few universities were setting up new departments of botany – see Allen, *The Naturalist in Britain*, chapters 4 & 8.

¹⁰ Harrison, 'Calcutta Botanic Garden and the Wider World', 235.

By the middle of the century, as part of a drive for administrative efficiency, British scientific institutions were also taking on a new life of their own, with codes to which individuals were subordinate. The Royal Society's decision in 1847 that Fellows would be elected solely on account of their scientific work,¹¹ and the introduction of competitive examinations for the civil service in 1853-54, were both examples of a general movement towards selecting people on merit. The forms of patronage represented by the official 'old corruption' were also challenged by the passage of such measures as the 1832 Reform Act and the 1835 Municipal Corporations Act.

Although the scientific culture was changing, patronage did not disappear entirely. Kew Gardens demonstrated the complexity of this process, with the Hooker family so closely identified with the institution. The outstanding abilities of William and Joseph Hooker were recognised by the knighthoods they both received, and by Joseph's election as President of the Royal Society in 1873. These very abilities, however, enabled them to wield strong powers of patronage, and their skill in identifying the right people for botanical jobs all over the Empire meant that their powers went unchallenged until the end of the nineteenth century. It can therefore be argued that advancement by merit became established more quickly in India, where it was more difficult for dominant or assertive British families to establish themselves in the same way. This chapter looks at the changing nature of patronage, and how it affected the work of the Botanic Garden. During this period, expectations from the international botanical network became more significant to the Calcutta Garden, as improved communications allowed an increase in the exchange of botanical material.

There were other important developments too. Landscaping and the appearance of the Garden first became contentious issues in the 1840s, and gradually involved the Government. The Garden also assumed an educational role, when the Superintendent was made Professor of Botany at the Medical College in 1837. Finally, horticulture was an important part of the Garden's activities, at least until the free distribution of plants was ended in 1856.

¹¹ <https://royalsociety.org/about-us/history>, accessed on 12th February 2015.

The first part of the chapter will look at the situation in Calcutta when Wallich returned in 1833. It will consider his subsequent career, and his response to the younger botanists who wanted to reorganise the work of the Botanic Garden. It will then examine the Garden's second period of uncertainty, around the time of Wallich's departure, and consider the reasons why Wallich's substantive successors, Hugh Falconer (1848-55) and Thomas Thomson (1855-61) had difficulty in developing the scientific capabilities of the Garden. Thomas Anderson (1861-69) brought a new and more energetic approach, although he was not able to do as much as he hoped because of the damage inflicted on the Garden by cyclones in 1864 and 1867. In 1869 he was forced to retire early because of ill health, so the future of the Garden was still not assured at the end of the period we are looking at.

Wallich's second period as Superintendent, 1833-46

A few months after Wallich had left Calcutta in 1828, Lord William Bentinck arrived with a brief to restore the East India Company's finances after the expense of the first Burmese War.¹² There was a budget deficit of over a million pounds on the total expenditure of £25 million.¹³ As it was very difficult to make cuts in such areas as administration and the courts, areas of discretionary expenditure like the Botanic Garden were vulnerable. The pressure on government finances was all the greater because the 1830s were a time of economic difficulty. In 1833 the Company's remaining trading functions in Asia were abolished. That (and recession at the time) led to instability as other firms competed for diminishing business. A number of the major trading companies, the agency houses, collapsed, and many British residents and Indian businessmen lost their fortunes.¹⁴ These changes meant that there was a good deal of debate about reforms that needed to be implemented in the 1830s.¹⁵

Bentinck understood the importance of science and technology better than his predecessors. All over the world, steam power was being used in ever more places

¹² John Rosselli, *Lord William Bentinck: the Making of a Liberal Imperialist 1774-1839* (London, 1974), 277-92.

¹³ Thompson and Garratt, *Rise and Fulfilment of British Rule*, 319.

¹⁴ Dietmar Rothermund, *An Economic History of India* (London, 2000), 22-27.

¹⁵ Thompson and Garratt, *Rise and Fulfilment of British Rule*, 318.

for ever more tasks.¹⁶ Bentinck had a particular enthusiasm for its application in India, and he devoted much effort to improving communications.¹⁷ In Britain, knowledge of electricity, astronomy, maths, geology and zoology was expanding thanks to the efforts of scientists like Faraday, Herschel, Babbage, Lyell and Owen.¹⁸ Botany was changing too, with John Lindley (1799-1865) and other young British botanists, gradually introducing natural systems of classification.¹⁹ Those who described themselves as scientists were also becoming more self aware and analytical. That was reflected in books such as William Whewell's *History of the Inductive Sciences* (1837), which attempted to map and systematise the development of the sciences. Whewell's work was important in provoking debate amongst some of the best minds in early Victorian England²⁰, and encouraging scientists to think deeply about their claims and methods.²¹ His analytical rigour ultimately gave new authority to their work.

The new interest in pioneering sciences and steam technologies was not confined to the senior levels of government in India. There was an increasing number of military surveyors, engineers, surgeons and government officials who felt cut off in India and wanted a way to exchange ideas and keep up with scientific developments in Europe. Captain J D Herbert, the Deputy Surveyor-General, conceived of the idea of a scientific journal to meet this demand, and between 1829 and 1831 produced regular issues of *Gleanings in Science*.²² Herbert himself was surprised at the number of local contributions he got for *Gleanings*. They covered a remarkable range of topics, from the need to mechanise papermaking and sawmilling in India, to Ricardo's theories of value, the potential for cinchona cultivation, and ice making on the Hooghly. The journal also summarised the proceedings of the Agri-Horticultural Society, the Asiatic Society and the Medical and Physical Society. *Gleanings* thus provided a means of exchanging ideas on 'progress' in India and of keeping up to date with all the main societies; that was very valuable, particularly for officers posted outside Calcutta.

¹⁶ Headrick, *The Tools of Empire*, 129.

¹⁷ Rosselli, *Lord William Bentinck*, 276.

¹⁸ Holmes, *The Age of Wonder*, 441-466.

¹⁹ Endersby, *Imperial Nature*, 174-176.

²⁰ John Stuart Mill, Charles Babbage and John Herschell were all stimulated by Whewell's thinking, though they did not accept all of his ideas.

²¹ Yeo, *Science in the Public Sphere*, V.

²² The 1830 and 1831 volumes were 400 pages long; by the third volume there were 260 subscribers, 30% of them army officers and 10% surgeons.

Gleanings had another important function. It drew attention to the debates going on in Britain, and notably to the efforts by Babbage and Herschel to reform the Royal Society, and to give power to serious ‘men of science’ rather than distinguished amateurs.²³ Editorials in *Gleanings* similarly argued for reform of the education system and the need to substitute science for ‘the study of dead languages’.²⁴ *Gleanings* was firmly on the side of those scientifically and technically qualified people in Britain who were making the case for careers to progress on the basis of ability and training rather than status and contacts. In September 1831 the British Association for the Advancement of Science (BAAS) was founded. In contrast to the older scientific societies, it did not involve grand premises or titled patrons: its focus was on communicating science and bringing it to the people.²⁵ There was no parallel in India for many years but, as we shall see, by the end of the 1830s, younger and more assertive surgeons were beginning to challenge established figures like Wallich who were used to operating within a hierarchical system and expected younger officers to defer to their seniority and experience. One contrast between Britain and India was the active, though modest, support for science by the East India Company. In contrast, most science in Britain was conducted without any direct Government involvement, and the initiative was left to the more specialist learned societies which had emerged in the late eighteenth and early nineteenth century. Only at the end of the 1830s did the British Government gradually become involved.²⁶

Gleanings only lasted for three years, but the Asiatic Society agreed to introduce a science-focused successor journal, the *Journal of the Asiatic Society of Bengal*.²⁷ With a slightly wider remit, it continued to be published for the rest of the nineteenth century. From time to time it was joined by other publications such as the *Indian Review and Journal of Foreign Science and Arts* (1837-41) and *The Calcutta Journal of Natural*

²³ Anonymous review of Charles Babbage, ‘The Decline of Science in England’, *Gleanings in Science*, 2 (1830), 229.

²⁴ Preface, *Gleanings in Science*, 1 (1829).

²⁵ Holmes, *The Age of Wonder*; Jack Morrell and Arnold Thackray. *Gentlemen of Science: Early Years of the British Association for the Advancement of Science*, (Oxford, 1981); Roy Macleod, “Whigs and Savants: Reflections on the Reform Movement in the Royal Society, 1830-48” in *Metropolis and Province: Science in British Culture, 1780-1850* (1983).

²⁶ Not only by taking responsibility for Kew Gardens in 1840, but also, for instance, by setting up the Geological Survey between 1835 and 1845 – see Allen, *The Naturalist in Britain*, 87-88.

²⁷ Preface to *Gleanings in Science*, 3 (1831).

History (1841-48). After the first issue of *Gleanings*, there was in fact always some periodical to keep people in India up to date with developments in science. As a result scientists in India felt better informed and less isolated, which contributed to a growing sense of confidence.

At the same time, a new generation of British scientists was arriving in India. Two young surgeons who had helped Wallich process his collections in Britain, Hugh Falconer and William Griffith, reached Calcutta before the end of Wallich's leave. Falconer succeeded John Forbes Royle as Superintendent of the botanic garden at Saharanpur, and Griffith proved to be a brilliant botanist who collected all over South Asia. Whilst Wallich was in Britain two other particularly able young men were also posted to Calcutta - the surgeon, William O'Shaughnessy (1809-89), and the assay-master, James Prinsep (1799-1840), both prime examples of original thinkers working on the imperial periphery. Together with Wallich, these two were prominent at the scientific soirées Lord Auckland introduced when he became Governor General in 1836.²⁸

In spite of these contacts, however, Wallich gave little sign of sharing in the new sense of scientific excitement that the younger scientists were bringing to India, and he failed to use the new Calcutta journals to publish and promote the work of the Botanic Garden. Wallich was forty-seven when he returned to Calcutta, relatively old in Indian colonial terms. He continued to work hard, but his weariness and recurrent illnesses after 1833 meant that it gradually became evident that he was failing to recover the scientific momentum or rebuild the herbarium. He was protected by the prestige he had acquired during his visit to Europe, and by his contacts with many of the leading figures in Government, so he continued to be able to attract enough resources to keep the Garden running, albeit at a more modest level than in the 1820s. However, bright young European scientists were beginning to see him as rather a traditional figure, dependent on established patronage networks. He was tellingly characterised as, 'A rather inferior Danish botanist, who has the reputation

²⁸ CNH Archives, Wallich Correspondence: Auckland to Wallich, 2nd January 1837.

here of being the cleverest in the world ...' by the talented French botanist, Victor Jacquemont.²⁹

LIST OF MEMBERS.	
Corrected to 1st October 1841.	
I. HONORARY MEMBERS.	
BRITISH.	
1840.	
May 14.	His Royal Highness PRINCE ALBERT of Saxe-Coburg and Gotha, K.G., G.C.B., &c. &c. &c.
1837.	
Feb. 9.	WILLIAM, DUKE OF DEVONSHIRE, K.G., D.C.L. &c. ROBERT BROWN, Esq., D.C.L., F.R.S., Hon. Mem. R.S.E., R.L.A., C.P.S., and H.S., Vice-President of the Linnean Society, London. AYLMER BOURKE LAMBERT, Esq., F.R.S., A.S., and H.S. Hon. M.R.I.A., Vice-President of the Linnean Society, London. NATHANIEL WALLICH, M.D., F.R.S.S.L. & E., F.L.S., Hon. Mem. C.P.S., Botanic Garden, Calcutta. (5)
FOREIGN.	
1839.	
Jan. 10.	His Majesty FREDERICK AUGUSTUS, KING OF SAXONY.
1837.	
Feb. 9.	ADOLPHE BRONGNIART, M.D., F.L.S., Hon. M.R.I.A., Member of the Institute of France, and Professor of Botany at the Garden of Plants, Paris. AUGUSTE PYRAME DE CANDOLLE, F.R.S., F.L.S., Member of the Institute of France, and Professor of Natural History, Geneva. BENJAMIN BARON DE LESSERT, F.L.S., Member of the Institute of France, Paris. FREDERICK ERNEST LUDOVIC DE FISCHER, M.D., F.L.S., Director of the Imperial Botanic Garden, St Petersburg. ELIAS FRIES, M.D., F.L.S., Member of the Royal Academy of Sciences, Stockholm, and Professor of Political Economy, Upsal. JANUS WILKEN HORNEWMANN, F.L.S., Professor of Botany, Copenhagen.

Figure 7. Wallich in distinguished company: in this list of five British Honorary Members of the Botanical Society of Edinburgh, Wallich's name appears alongside those of a Prince and a Duke, and two of Britain's most eminent botanists (courtesy the Central National Herbarium, Kolkata).

It also gradually became evident that Wallich was not keeping up to date with the latest professional developments: most notably he was slow to get to grips with the natural systems of plant classification which were replacing the Linnaean system.³⁰

²⁹ V. V. Jacquemont, *Letters from India*, 2 Vols. (London, 1835): Letter to M. Victor de Tracy, 1st September 1829.

³⁰ Most people in the Nordic countries and Britain continued to use the Linnaean system in the early nineteenth century but the French were already finding it unsatisfactory. Bernard and Antoine-Laurent de Jussieu at the Jardin des Plantes in Paris developed a natural system that was refined by the Swiss botanists Augustin-Pyrarnus and Alphonse de Candolle. Robert Brown first introduced the natural system to Britain in 1810 and William Hooker's *Flora Scotica*, published in 1821, used it. By about 1830 most professional botanists in Europe had turned to the natural system. However there was a continuing debate about the two systems in Britain, and overlapping use, in the 1830s and 1840s – see Endersby, *Imperial Nature*, ch. 6, and Arnold, 'Plant Capitalism', 926-7.

In 1829, whilst Wallich was on leave, the activities of the Garden were assessed by the Civil Finance Committee that had been set up to make the budgetary savings demanded by the East India Company. Bentinck's cost cutting exercise trimmed some 10% off the overall budget,³¹ but the Committee concluded that the Garden should receive harsher treatment. Their assessment was very important, as this was the first time that government officials seriously reviewed the Garden's objectives, and considered whether it provided value for money. Their conclusions showed that they did not think that the Garden was meeting official expectations:

26. In considering the Establishment of the Botanical Garden at Calcutta, we have had to regret the absence of the Superintendent, who could doubtless have afforded us much information not to be found on the Public Records, or otherwise procured: we have, however, examined the Nurseryman attached to the Institution, and have endeavoured to ascertain from other sources, the advantages which have practically resulted from it.

27. The labors (*sic*) of Dr Wallich and his Predecessors appear to have been eminently successful in extending Botanical knowledge, and, although the institution has not, as far as we can learn, tended in any great degree to the general introduction of the culture of rare and valuable articles of produce, or otherwise materially promoted the Agricultural and Commercial interests of the Country, the circumstance is rather attributable to the condition of Society and the state of the Country than to any inherent defect or inefficiency.³²

They went on to propose that the budget for the Garden be reduced from Rs. 1,828 to Rs. 1,250 per month, and that there should be a decrease in the Superintendent's salary when Wallich retired, from Rs. 1,500 to Rs. 500, suggesting that:

The duties are by no means irksome or labourious (*sic*) – nay, affording as the appointment does, the means of prosecuting a favorite (*sic*) pursuit, it will generally be regarded by the individual selected to fill the situation of Superintendent as particularly attractive or agreeable. With the advantage of a good House, we are of the opinion that the salary might unobjectionably be reduced to Rupees 500 per mensem, and the situation might conveniently be held by a Medical or other Officer filling some other situation at the Presidency.³³

These judgements were to have serious consequences. In 1830 the Directors accepted the Committee's recommendations and the cuts were implemented.³⁴ That

³¹ Thompson and Garratt, *Rise and Fulfilment of British Rule*, 319.

³² BL IOR Board Collections F/4/2186 No.106661: Letter from the Civil Finance Committee, dated 1st October 1829.

³³ Ibid.

³⁴ BL IOR Public Letter to Bengal, 29 Sept 1830.

threatened the Garden's capability to continue 'extending Botanical knowledge'. Although they left Wallich with enough money to continue to employ most of his staff, the cuts meant that he was no longer able to progress work by employing collectors, rebuilding the herbarium and keeping the library up to date. There was an even greater threat in the proposal to employ what would have been a part-time superintendent, possibly with no botanical expertise, when Wallich retired. The Government was in effect saying that it no longer wished to support an active, knowledge creating institution, as the Garden would probably have reverted to being nursery and a park.

Wallich was slow to counter these threats and it gradually became evident that the way that he did things was no longer working. Even though he had a sympathetic ally in Sir Charles Metcalfe, who acted as Governor General for a year (March 1835-March 1836), Wallich did not mount a concerted campaign to get the Garden's budget restored. In 1838 Metcalfe³⁵ returned to Britain, and Wallich lost another old ally when William Carey died in 1834. The Council in Calcutta asked Wallich to report on the usefulness of the Garden in 1831, but he could not do so as he was on leave until March 1833. Remarkably, however, he delayed responding for three years, which tried the patience of the Council and the Directors.³⁶

Wallich pleaded that he had been preoccupied with his work on the Tea Committee, but even when he did report in October 1836, he did not mount a particularly effective defence. He suggested that the Finance Committee did not fully understand the purposes of the Garden, and said that he was grieved by its conclusions which belittled the efforts of the 'great men' who had preceded him. He discussed the difficulties of growing plants in the hot climate of India, and then went on to set out what he believed the objects of the Garden were:

- to bring light to as many as possible of the vegetable stores which nature has so bountifully provided for the country
- to cultivate all that has the least tendency or holds out any prospects of becoming of general utility

³⁵ Metcalfe was a senior administrator and Supreme Council member. He supervised the Botanic Garden between 1828 and 1833, whilst Wallich was on leave, and tried subsequently to defend the Garden's interests.

³⁶ BL IOR Letter No. 62 from Court of Directors to Governor of Bengal, 16th September 1835.

- to disseminate all such plants as widely as possible.³⁷

This list was rather vague, but it was important as it was the first time that a superintendent set out his views on the purposes of the Garden. Several of Wallich's successors made similar statements, so that gradually an agreed list of the aims emerged. It is notable that Wallich's first object was essentially the scientific investigation of India's flora, although his use of the word 'stores' suggested an economic purpose as well. Turning to his collecting, Wallich said that the Garden contained nearly double the number of species that appeared in Roxburgh's 1814 catalogue, and he promised to publish his own catalogue within a year (in 1844 Griffith disputed Wallich's figures, and also complained that no new catalogue was in fact prepared).³⁸ Wallich then recounted the achievements of the Garden under various heads.

It is clear from the way that he organised his correspondence, and the swift publication of *Plantae Asiaticae rariores*, that Wallich could be an effective administrator. However, his 1836 report was not a very systematic piece of work. His list of achievements bore little relation to his objectives, and there was no suggestion of how he would 'bring light to as many as possible of the vegetable stores'. The report was verbose, but paid little attention to priorities. It was not enough to persuade Lord Auckland, who had visited the Garden several times, to restore the 1830 cuts.

Wallich wrote a further report in 1840. He aimed this directly at Lord Auckland and the tone was more obsequious. Again Wallich showed little sense of priorities and he spent pages describing in detail the various species growing in the Garden, not all of them successfully. He complained about the demands on his time, especially his 'incessant and laborious correspondence'.³⁹ Amongst his achievements he mentioned the Garden's growing international network, with Jamaica as the latest member, and the increased distribution of plants to 'natives'. He discussed transport improvements, with plants surviving much better in the recently introduced Wardian cases, and seeds germinating more successfully when sent to Britain via the newly

³⁷ BL IOR F/4/1761 72126 Wallich's Report on Calcutta Botanic Garden, 1st October 1836, para 6.

³⁸ BL IOR F/4/2128 no. 100275 Griffith's Report on the Botanic Garden, 1843.

³⁹ BL IOR F/4/1949 no. 84713 Wallich's Report on Botanic Garden, 21st December 1840, para. 10.

established and much faster overland route through Egypt.⁴⁰ Two things are notable about Wallich's reports: he did not propose any plan to address problems he had identified, and he failed to make good use of statistics to back up his case.

The report of the 1829 Finance Committee, and the subsequent comments and instructions from the Governor General, showed clearly what the official concerns about the Botanic Garden were. Wallich did try to respond to some of them. To rebut the criticism that the Garden had contributed little to the introduction of useful plants, he became a very active and committed member of the Tea Committee set up by Bentinck in February 1834.⁴¹ He then made sure that the Garden was actively involved in the trialling and transfer of tea plants from China to Assam.⁴² To improve his credentials in supporting economic botany Wallich also associated the Garden with the work of the Agri-Horticultural Society. To avoid competition for government funds, Wallich worked closely with the Society, and he made a sensible tactical decision in 1835 when he allowed it to use part of the Botanic Garden for its experiments with cotton, sugar, indigo, tobacco, fibre-producing plants and vegetables. That meant that he could say that the work for which the Botanic Garden had been set up was being done on its premises, but it also meant that the Agri-Horticultural Society had no need to establish a separate base that might compete with the Botanic Garden. Chapter Five looks at this this relationship in more detail.

Wallich also sought to recover Government favour by developing the Garden's nursery work, building on his talents as a nurseryman, a key practical skill when so much depended on the successful nurturing and packing of plants for despatch. He succeeded in transferring many Indian species to gardens and to plant collectors all over the world, and set up exchanges with the botanic gardens at Peradeniya and Buitenzorg, as well as various European gardens.⁴³ Equally significantly, he helped to collect and transmit plants for interested British aristocrats. He was particularly assiduous in making sure that visit to Bengal and Assam in 1835-36 by the Duke of

⁴⁰ Ibid. para. 12.

⁴¹ BL IOR Revenue Consultation 6, 1st February 1834.

⁴² Burkill, *Chapters on the History of Botany*, 57-58.

⁴³ BL IOR F/4/1949 no. 84713 Wallich's Report on Botanic Garden, 21st December 1840, para. 9.

Devonshire's gardener, Gibson, was successful.⁴⁴ Such efforts helped to preserve his reputation in Britain and counter any questioning of it in India. Wallich was involved in a further Government initiative when in 1837 he was appointed Professor of Botany at the newly established Calcutta Medical College (see Chapter One).⁴⁵

Wallich proved to be a committed and effective teacher, and he was popular with his students and with colleagues. However, he disappointed his students when he left for the Cape in 1842. They asked him to produce a students' guide to botany in India based on his lectures whilst he was on leave,⁴⁶ but Wallich's energy was fading, and he did not respond to their challenge.

Before 1828, Wallich had spent more time in the field than any other superintendent. But after 1833, he was more cautious, and anxious about his health. Consequently, his only significant expedition was to investigate tea growing in Assam in 1835-36. This lack of activity might not have mattered if he had set up a systematic collecting network and made a sustained effort to replace the herbarium specimens taken to London in 1828, but he did neither. Nor did he do much to obtain up to date books for the library.⁴⁷ Consequently Wallich made it difficult for the botanists who followed him to work effectively. Griffith, and most of Wallich's other successors, resented his lack of foresight and apparent lack of commitment to the botanical work that still needed to be done in India.⁴⁸ As little was coming into the herbarium, there were few novelties to report either, and Wallich's only publications after 1833 were occasional contributions to the *Journal of the Asiatic Society of Bengal*.

Wallich's failure to recover scientific momentum in the 1830s, and to counter the decline in official confidence, also meant that Calcutta lacked the credibility needed to take the lead in coordinating botanical work being done in other parts of India. Wallich was ceasing to be recognised as leader of the whole botanical enterprise, even though he was head of the premier botanic garden. That concerned Lord

⁴⁴ See CNH Kolkata Wallich Correspondence, letters of 5th September and 8th October 1835 to Gibson.

⁴⁵ http://en.wikipedia.org/wiki/Medical_College_and_Hospital,_Kolkata, accessed on 30 March 2015.

⁴⁶ CNH Archives Wallich Correspondence, Petition from students of Calcutta Medical College to Wallich, 7th April 1842.

⁴⁷ CNH Archives, Kolkata: Report on the Botanic Garden by W. Griffith, 1843.

⁴⁸ Thomas Thomson, 'Notes on the Herbarium of the Calcutta Botanic Garden, with special reference to the completion of the Flora Indica', *Journal of the Asiatic Society of Bengal*, Vol XXV pt v (1856), 4.

Auckland, who chided him in 1841 for not being more proactive in coordinating botanical work, suggesting that:

... a more frequent Correspondence with that Officer (*Falconer, in Saharanpur*) as with the Gentlemen such as Dr Wight and Mr Gibson, who take a lead in the botanical pursuits of Madras and Bombay might be of advantage as well to you as to the other parties.⁴⁹

Wallich did, in fact, maintain cordial relations with Robert Wight, but as the leading botanist in south India, Wight operated almost entirely on his own initiative.⁵⁰ Wight tried to meet the demand for a comprehensive botanical publication, but lacking the sort of institutional base that Wallich had, he was unable to finish it.⁵¹

After 1836 the frustrations of other botanists began to show. The first challenge to the way that Wallich was running the Botanic Garden had its roots in the expert delegation on tea growing in Assam that he led in 1835-36. The other members were William Griffith, only twenty-five years old but already recognised as one of the best botanists in India, and John M'Clelland another bright young member of the Indian Medical Service, chosen particularly for his knowledge of geology. Wallich already knew Griffith, who had assisted him by producing some of the drawings for *Plantae Asiaticae Rariores* in 1830-31, as the tribute in Figure 8 below shows.

⁴⁹ BL IOR F/4/1949 84713 No. 909 Secretary of Government of Bengal to Wallich, 7th April 1841.

⁵⁰ Burkill, *Chapters on the History of Botany*, 52.

⁵¹ Henry Noltie, *The Life and Work of Robert Wight*, I, 93-107. Wight's *Illustrations of Indian Botany* and *Icones Plantarum Indiae Orientalis* were the first floras for India in which the natural system of classification was followed.

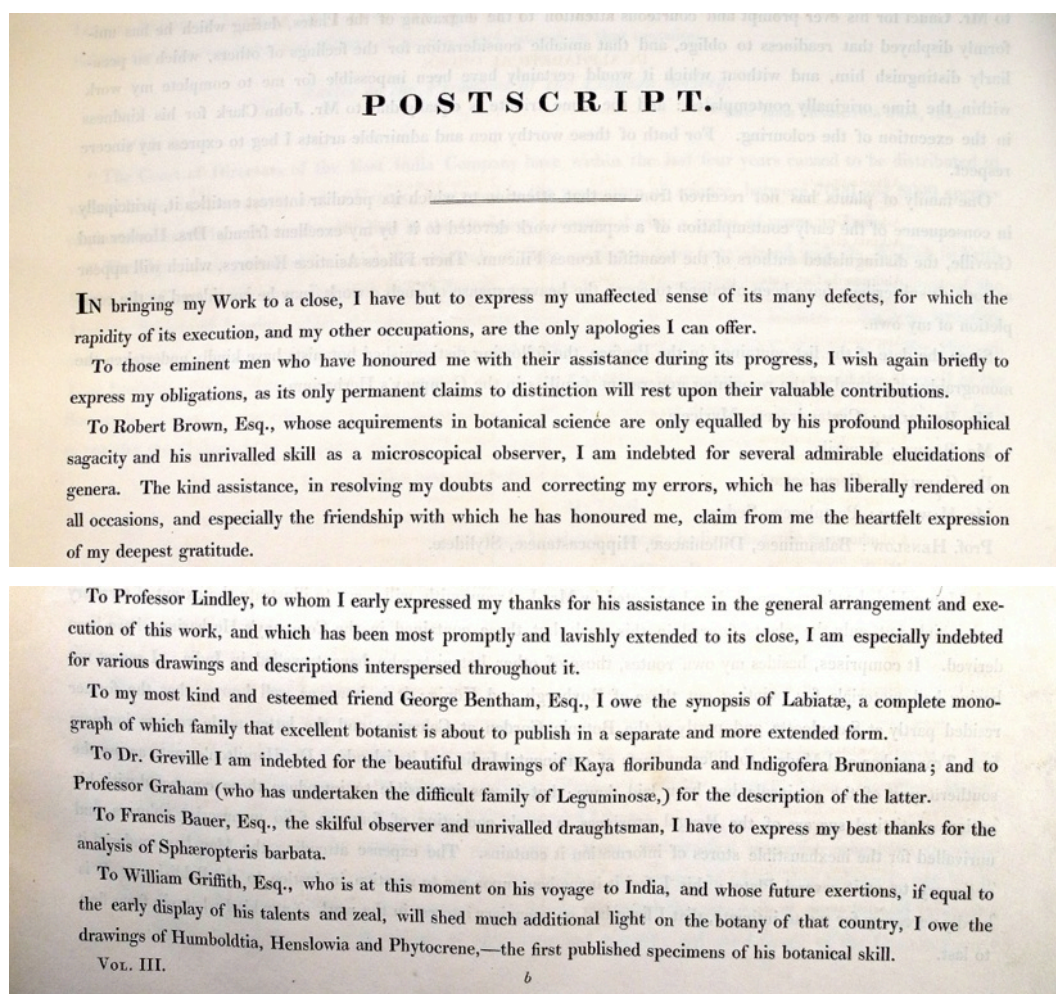


Figure 8. Wallich's tribute to William Griffith (and others) in Volume Three of *Plantae Asiaticae Rariores* in 1832 (reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew).

This relationship broke down during the visit to Assam. Years later, in 1848, McClelland printed a pamphlet describing the dispute.⁵² He claimed that the problems arose because of Wallich's jealousy of Griffith's superior botanical collecting ability whilst the party was travelling to Assam in 1835. McClelland was Griffith's close friend, admirer and executor, so it is impossible to know how fair the account is. What is clear is that there was a major clash between the brilliant, focussed and energetic Griffith and Wallich, who was anxious about his health, concerned at any threat to his professional authority and subject to emotional

⁵² RBG Kew Library, Memorandum – Regarding the differences between Dr. Wallich and the late W. Griffith (Calcutta, 1848).

outbursts. This was to have serious implications for the practice of botany in Bengal over the next few years.

In 1842 the criticism of Wallich by his fellow botanists came into the open. The Government had Wallich's 1840 Report printed as a public document, and an anonymous writer (assumed to be M'Clelland) reviewed it at length.⁵³ This review can be seen as the outcome of the disputes in Assam, and the first shot in a campaign by younger surgeons to reform Calcutta Botanic Garden. The reviewer focused on Wallich's lack of rigour. He complained that Wallich's painstakingly compiled plant lists offered little real information. He regretted that Wallich did not distinguish between useful and useless plants. The review went on to criticise the lack of effort to make exotic plants grow, and queried whether any useful plants had in fact been introduced to India via the Botanic Garden since 1814.

The review was uncharitable and gave Wallich no credit for his undoubted hard work and achievements, but it expressed a profound frustration. In trying to defend the Garden's work, Wallich gave high priority to impressing the Governor General, Lord Auckland, a representative of the traditional British aristocratic patronage network which had served Wallich well in the past (see Figure 9). But that network was becoming less important by the 1840s⁵⁴. The younger surgeon-scientists realised that, in future, institutions would have to show that they were well focussed, and run according to more objective and impersonal criteria. That is what would impress governments, and a new generation of administrators, who were gradually introducing these more bureaucratic norms. It soon became ever clearer that, despite the Garden's effective work on the introduction of tea growing, the government was no longer satisfied with its performance, and once Wallich went on sick leave officials encouraged the botanists who took over to introduce reforms.

⁵³ *Calcutta Journal of Natural History*, II (1842), 288-94. The review is unsigned but M'Clelland was the editor and the main contributor, so it is virtually certain that he was the author.

⁵⁴ See Drayton, *Nature's Government*, 168.

FIRST LIST OF SUBSCRIBERS.	
THE KING'S MOST GRACIOUS MAJESTY.	
	COPIES
The Honourable East India Company	40
His Royal Highness the Duke of Sussex	1
His Royal Highness Prince Leopold of Saxe Coburg	1
His Royal Highness the Duke of Orleans	1
His Royal Highness Prince Frederick Augustus, Duke of Saxony	1
The Prince of Essling	1
His Grace the Duke of Bedford	1
His Grace the Duke of Buccleugh	1
His Grace the Duke of Buckingham	1
His Grace the Duke of Northumberland	1
Her Grace the Duchess of Northumberland	1
His Grace the Duke of Somerset	1
The Most Noble the Marquess of Bute	1
The Most Noble the Marquess of Stafford	1
The Right Honourable Earl Amherst	1
The Right Honourable Countess Amherst	1
The Right Honourable Dowager Countess of Aylesford	1
The Right Honourable Earl of Carnarvon	1
The Right Honourable Earl of Dalhousie	1
The Right Honourable Earl of Darnley	1
The Right Honourable Earl of Dartmouth	1
The Right Honourable Earl Fitzwilliam	1
The Right Honourable Dowager Countess of Guildford	1
The Right Honourable Earl of Hardwicke	1
The Right Honourable Earl of Mountnorris	1
The Right Honourable Earl of Orford	1
The Right Honourable Earl of Plymouth	1
The Right Honourable Earl Powis	3
The Right Honourable Earl Spencer	1
His Excellency Lord W. Bentinck, Governor-General of India	1
The Right Honourable Lord Ducie	1
The Right Honourable Lord Colchester	1
The Right Honourable Lord Grenville	1
The Right Honourable Lord Viscount Milton, M. P.	2
The Right Honourable Lord Ashley, M. P.	1
Count Caspar von Sternberg, President of the National Museum Society of Bohemia, in Prague	1
The Honourable R. H. Clive, M. P.	1
The Honourable C. F. Stuart	1
Sir E. H. East, Bart., M. P.	1
Sir Robert Johnson Eden, Bart.	1
Sir Abraham Hume, Bart.	1
Sir Charles Metcalfe, Bart. Calcutta	1
Sir C. Gray, Chief Justice, Calcutta	1
Baron Benjamin De Lessert, Paris	1
Baboo Dwarkanauth Tagore, Calcutta	1
Baboo Ram Comul Sen, ditto	1
Baboo Silchander Doss, ditto	1
Baboo Radhacanta Deb, ditto	1

Figure 9. The world of aristocratic patronage: subscribers to Wallich's *Plantae Asiaticae rariores* (reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew).

The reviewer of Wallich's report also reflected other new early-Victorian values. Starting in the 1830s, the rulers of Britain's overseas territories were gradually acquiring a new language of statistical expertise.⁵⁵ Increasingly the collection and tabulation of detailed information was seen as a tool of "modern" management,

⁵⁵ Laidlaw, *Colonial Connections*, Ch.7.

allowing greater control and comparison with comparable institutions. Wallich's rambling lists were no longer acceptable: the new generation wanted properly organised statistical information. Wallich was seriously ill in 1841. That, and the impact of previous illnesses, weakened him so much that in 1842 he was authorised to spend two years in a healthier climate.⁵⁶ He chose to go to the Cape of Good Hope. That was virtually the end of his superintendence. He did return to Calcutta for another eighteen months but he achieved little in that period.

When Wallich finally went back to Britain in 1846 his health improved, and he was able to enjoy eight years of retirement before he died at the age of sixty-eight. By his own lights he had been a success and there were indeed many achievements. The number of species that bear his name is evidence of how he had advanced knowledge of the Indian flora.⁵⁷ Not only had he collected many new species and taken specimens back to Europe, but he had also engaged many of Europe's finest botanical minds in the enterprise.

Wallich's superintendence has been the subject of a number of recent scholarly works. David Arnold has highlighted his multiple identities, not only as a successful plant collector and an agricultural and horticultural "improver", but also 'as a botanical entrepreneur who made the "riches" of Indian plant life known and accessible to Europe.'⁵⁸ Arnold rightly stresses Wallich's role 'as a loyal employee who assiduously served the Company's material interests in forestry and botany'.⁵⁹ Another historian of science, Mark Harrison, has shown how important was Wallich's use of the Garden's repository of plants to cultivate a vast network of correspondents. That enabled him to raise his and the Garden's profile, but Harrison concludes that it was Wallich's keenness to have an impact in Europe that led to the distribution of the Calcutta herbarium, and the subsequent decline of the Garden's scientific capability.⁶⁰ We have noted Wallich's anxious and obsequious approach to those in authority, and Richard Axelby supports this in drawing attention to Wallich's

⁵⁶ CNH Kolkata Wallich Correspondence: H. Bayley, Asst Secretary to the Government of Bengal to Wallich, 29th June 1842.

⁵⁷ Burkill, *Chapters on the History of Botany*, 32.

⁵⁸ Arnold, 'Plant Capitalism and Company Science', 928.

⁵⁹ Ibid.

⁶⁰ Harrison, 'Calcutta Botanic Garden and the Wider World.'

insecurity, and the way that his need for reassurance and acceptance, became important drivers of his scientific work.⁶¹



Figure 10. Wallich's prize specimen: Amberstia nobilis as it appeared in Plantae Asiaticae rariores, (reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew), and an example in the Garden in 2013.

We should remember, however, that Wallich came from a generation of individualist botanists, who saw their herbaria as personal possessions. As noted in Chapter Two, the rules defining personal and institutional property were still being introduced in the early nineteenth century, and Wallich probably saw it as the responsibility of his successors to build up their own herbaria. But he did not do much to encourage his artists in his later years, and he did nothing to maintain an up to date library. It took over twenty years for his successors to make up the lost ground.⁶² Wallich did maintain a wide circle of collaborators and correspondents during his last thirteen years in Calcutta, and his voluminous correspondence is evidence that he kept very busy. There were achievements, particularly his support for the introduction of tea

⁶¹ Axelby, 'Calcutta Botanic Garden and the colonial re-ordering of the Indian environment', 153.

⁶² RBG Kew DC 155: Anderson to Joseph Hooker, 22nd April 1866.

cultivation, but overall there is little doubt that there was inertia at the Botanic Garden after 1833, and that standards of administration declined.⁶³

Re-energising the Garden: the interventions of William Griffith and Joseph Hooker

Wallich's voyage to South Africa in 1842 meant that a temporary superintendent was needed. There were several possible candidates, and the appointment would be significant as it was probably assumed that Wallich's poor health would prevent him from returning. The job went to William Griffith. In India Griffith was recognised as an outstanding botanist, but he was also known as someone who did not suffer fools gladly, and his disputes with Wallich were no secret,⁶⁴ so his appointment was an implied criticism of Wallich's management over the previous decade.

Griffith brought a new attitude to institutional support. He had been a great traveller, but in contrast to Wallich's mobile vision of his science, Griffith wanted to fix things in one place. That was partly because he was a morphologist as well as a systematist.⁶⁵ He needed a fixed base not only to accommodate a library and herbarium, but also as a place where he could indulge his passion for detailed examination of growing plants. His commitment is vividly stated in one of his letters: 'Botanists don't study their subject, but plunge into it neck and crop, and without intimate study of structure and physiology, how is it possible to find even a false key to the real structure and natural arrangement.'⁶⁶

He tackled his task with great energy. After his first few months at the Botanic Garden, he wrote a comprehensive report in 1843 recommending changes in almost all aspects of the Garden's work. Griffith had none of Wallich's inhibitions or hesitation about report writing and outlined improvements that offered a clear way forward. First he analysed some of the shortcomings of the situation he found, neatly stating what needed to be done and why:

⁶³ See comments on the state of the library, and section VII on 'Desirable Changes and Improvements', in Griffith's 1843 Report.

⁶⁴ Arnold, *The Tropics and the Travelling Gaze*, 172-76.

⁶⁵ Leonard Huxley, *Life and Letters of Sir Joseph Dalton Hooker* (London, 1918), i, 234.

⁶⁶ RBG Kew MUN/1 Munro Letters: Griffith to Munro, 20th May 1844.

After attentive examination of the Gardens, it has appeared to me that the following changes and improvements are very desirable.

1. The formation of a proper fence round the land boundaries of the Garden.
At present it is accessible from all quarters, and is consequently liable to suffer from depredations.
2. The introduction of some uniform system with reference to the divisions of the Garden...
At present the divisions have no reference to obvious boundaries; there are divisions without nurseries, and nurseries outside divisions; ...
3. The introduction of general uniformity in design and scenic effect.
At present part is laid out in landscape style, part in an old and obsolete artificial style.
4. The general thinning of the trees.
At present the Garden is literally choked with trees, many of them mutilated, some half blown down; the consequence is a needless drain on the soil, the production of unnatural specimens, and a great deterioration in effect.⁶⁷

Griffith continued in the same vein for fifteen paragraphs altogether, with much emphasis on the need for order, regularity, efficiency and scientific updating.

Griffith borrowed surveying instruments from the Survey Department and produced new plans of the Garden. During the later part of 1843 he started to implement a complete reorganisation so that each area of the Garden would be devoted to a particular function. Griffith wrote a further report in June 1844 just before he handed the Garden back to Wallich. It is worth contrasting the opening of Wallich's 1840 report with Griffith's. Wallich's report was a narrative that started:

In doing myself the honor to submit my report on this Garden to the Right Hon'ble the Governor of Bengal, I have to repeat my earnest apologies for the delay that has occurred, and in so doing I beg permission to refer to my explanatory letter...

2. The accompanying four documents, extracted from the records of my office, I humbly trust will serve to place in a clear light the exertions and progress which have been made during the last five years.... to fulfil the objects of this institution. On their details I venture most respectfully to rest my hopes of His Lordship's approbation, and of my anxious efforts to promote, as far as I was able, the

⁶⁷ CNH Archives, Kolkata: *Report on the Hon'ble Company's Botanic Gardens*, Calcutta (1843) Part VII, Desirable Changes and Improvements.

Agriculture and Horticulture of this country, not being found quite vain and⁶⁸ fruitless.

In contrast, Griffith made no attempt to humble himself or seek approbation, but immediately let the reader know how the report was organised:

I have the honor (*sic*) of submitting a report⁶⁹ on the Hon'ble Company's Botanic Gardens in the following parts:

A. Garden Department	-----	Paras 1 to 20
----- „ -----	Remarks on lists	„ 21 - 25
----- „ -----	Miscellaneous Garden operations	„ 26 - 35
B. Library Department		„ 1 - 4
---- „ -----	Painters	„ 5 - 7
C. Herbarium Department		„ 1 - 5
D. Proposed Modifications of the Establishment		„ 1 - 6
E. General Remarks		„ 1 - 8
Appendix A.	Lists A to L	
Appendix B.	Copies of Communications giving Characters of timbers.	

The younger surgeon-naturalists represented a different approach to administration as well as to science. Griffith's reports presage the more detached, impersonal bureaucracy of the later nineteenth century. Griffith was shocked by what he believed was Wallich's indifference to record keeping and library maintenance. It is particularly notable that whilst Wallich usually wrote as if he was reporting on his own performance, Griffith made a far more objective institutional survey. Interestingly Griffith did not feel that the Garden was underfunded, but proposed a number of changes to utilise available resources better.⁷⁰ Griffith also acknowledged the support of his staff, and appreciated their skills. He wrote:

⁶⁸ BL IOR F/4/1949 No. 84713: Report by Wallich on Calcutta Botanic Garden, 21st December 1840.

⁶⁹ BL IOR F/4/2128 No. 100725: W. Griffith to A. Turnbull, Under Secretary to the Government of Bengal, enclosing report on Calcutta Botanic Garden, 21st June 1844.

⁷⁰ CNH Archives, Kolkata: *Report on the Hon'ble Company's Botanic Gardens* by W. Griffith, 1843, Part V.

It only remains to mention that in the changes contemplated, or now being prosecuted, I have had every occasion to be satisfied with the intelligence and exertions of Mr Ross, the Head Gardener, Mr Dougherty, the Overseer; Womanund Dutt, the then Head Sircar,⁷¹ & Buxoo & Huttoo, Head Mallies;

It (the Catalogue) has been drawn up from the books kept by Buxoo, one of the head Malees,⁷² a person of abilities and extraordinary memory, capable of keeping pace with the most modern system of nomenclature. He is the only person in the Gardens acquainted with the names of the plants, and if any accident happened to him, no Catalogue at all could have been submitted.⁷³

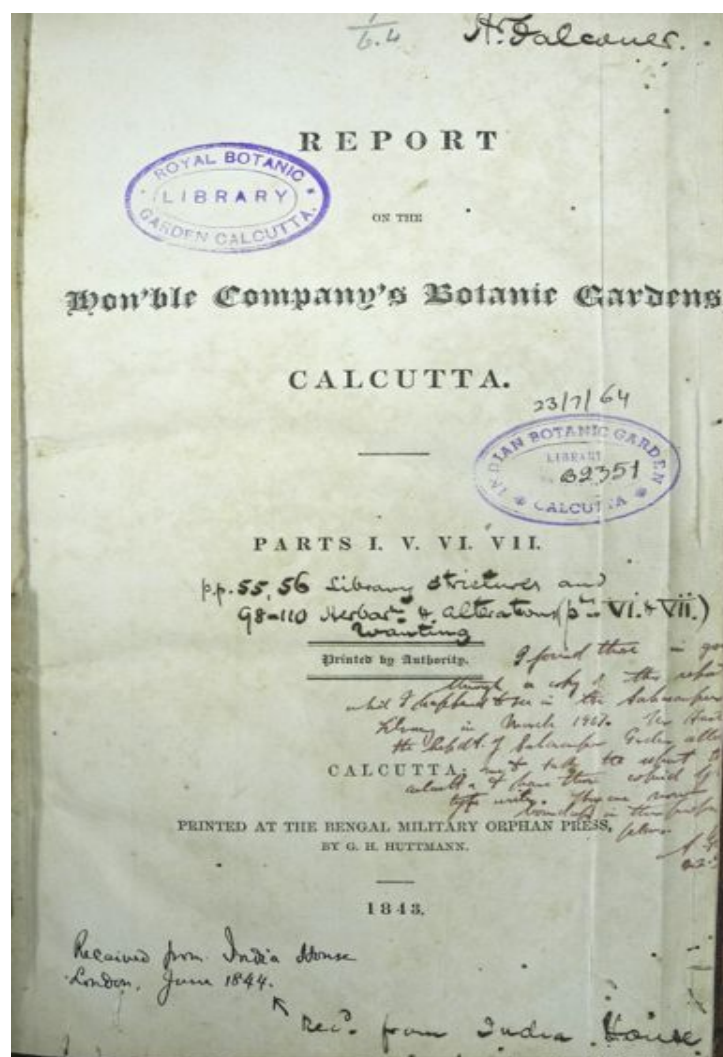
These latter remarks, on the General Catalogue of Plants, were another reminder that knowledge formation in India at that time was often a joint enterprise.

Griffith wrote in a completely different way to Wallich, and his identity as a botanist was so strong that his prime loyalty was to his subject and to his fellow botanists. His attempts to make changes drove landscaping on to the agenda, and no subsequent superintendent could ignore it. Griffith spent less than two years at the Botanic Garden but he breached a dam that was forming because of Wallich's failure to address so many managerial issues. By seizing the initiative and writing so cogently he set the agenda for the rest of the century. After Griffith it was impossible to go back to Wallich's way of managing the Garden. There is little that was done later, even by George King at the end of the nineteenth century, which is not presaged in Griffith's reports and recommendations.

⁷¹ Chief Clerk.

⁷² Indian word for gardener.

⁷³ CNH Archives, Kolkata: *Report on the Hon'ble Company's Botanic Gardens*, Calcutta, 1843, Part I, Remarks on the General Catalogue of Plants.



The Directors had clearly been impressed by Griffith's energy and organisational ability, but they still put the promotion of scientific knowledge as the last of the three main objectives of the Garden.

When Wallich returned to India in August 1844, the Deputy Governor of Bengal therefore added salt to Wallich's wounds by telling him to implement Griffith's proposals.⁷⁵ Wallich cut a sad figure during his last eighteen months in Calcutta, and had clearly become an obstacle to realising the Government's expectations of the Garden.⁷⁶ He was bitter about what Griffith had done. Writing to Sir William Hooker on 8th February 1845, some six months after his return from the Cape, Wallich once again revealed how different a vision he had for the Garden, and how little he understood of the younger surgeons' desire to inscribe science:

You see that I am still at my old post – how long I may still continue here is uncertain. I wish I could leave immediately for I have had enough of India, but circumstances keep me fixed for the present. Remaining is a source of much pain – more than I can possibly express to you; for where is the stately, matchless garden that I left in 1842? Is this the same as that? Can it be? No – no – no! Day is not more different from night, than the state of the garden as it was, is from its present utterly ruined condition.⁷⁷

Wallich finally left India in 1846, by which time Griffith had died, so the East India Company had to identify a new superintendent. The Company had intended to implement the reduction of the Superintendent's salary from Rs. 1,500 per month to Rs. 500 when Wallich retired. That would only have attracted a very junior and poorly qualified surgeon and the Garden would have ceased to do any serious botanical work. The most important voice in making sure that the salary was not reduced was John Forbes Royle,⁷⁸ former superintendent of the Saharanpur Botanic Garden, and by 1846 Professor of Materia Medica at King's College, London as well as being unofficial advisor on natural history to the East India Company in London.⁷⁹ Since the death of Sir Joseph Banks in 1820, decisions about the Botanic Garden had largely been made in India. However, Royle's Indian experience, powers of analysis

⁷⁵ BL IOR F/4/2128 No.100725: Letter from A. Turnbull to Dr W. Griffith, dated 25th July 1844.

⁷⁶ Arnold, 'Plant Capitalism and Company Science', 928.

⁷⁷ RBG Kew Archives, Wallich Letters: Wallich to Sir William Hooker, 8th February 1845.

⁷⁸ BL IOR F/4/2186 No.106661: Letter from Royle to the Court of Directors, dated 19th November 1845.

⁷⁹ His formal title was Conductor of Correspondence on the Vegetable Products of India.

and detailed knowledge of the Company enabled him to intervene in an authoritative way, so in the 1840s the Garden was once more subject to guidance and supervision from London. In this sense Royle can be seen as a pioneering figure, providing a new coordinating role for Indian botany until Kew began to do the job more effectively after Joseph Hooker's visit to India.



Figure 12. John Forbes Royle after he had retired to Britain

When Forbes Royle was asked at the end of 1845 for his opinion on who should get the post of Superintendent in Calcutta, he wrote a long and thoughtful reply, setting out the purposes of the Garden. He explained the qualities required of a superintendent, and listed seven possible candidates, starting with Dr Wight in Madras, who by that time had made it clear that he did not want the job. Forbes Royle therefore recommended Falconer, who had been at Saharanpur. The East India Company had little hesitation in acting on this recommendation, as Falconer was clearly the person best qualified after Griffith's death and Wight's lack of interest in the job.

Just before Falconer took over as Superintendent, a document entitled *Memorial on the Calcutta Botanic Garden* appeared in London. The writer (almost certainly Forbes Royle)⁸⁰ argued that the Garden should be considered,

⁸⁰ RBG Kew Archives MR 225, Folios 21-25: *Memorial on Calcutta Botanic Garden* (1846?). The *Memorial* is written in Falconer's distinctive hand, but Ray Desmond suggests in *The European Discovery of the Indian Flora*, 98, that J Forbes Royle is likely to have been the author, and that Falconer copied it.

in a triple light:

- 1st. as a scientific institution, for investigating the botany of India;
- 2nd as an institution of public utility for the cultivation of useful plants;
- 3rd as an educational institution, subservient to the wants of Calcutta Medical College, of which the Superintendent is one of the Professors.⁸¹

This was a clearer statement of the Garden's purposes than Wallich had managed, and, in contrast to the Directors' 1846 letter, placed science as the first priority. The writer reiterated the valuable contributions the Garden had made to Indian botany, and the 'high European reputation' thereby attained. He complained that the Garden was losing that reputation because of the withdrawal of funding for collectors. He also followed Griffith and M'Clelland in criticising Wallich for not retaining duplicate specimens for the herbarium in Calcutta, and said, "This is a matter deeply to be regretted, and until remedied, it must entail much loss of time on every future Superintendent."⁸²

The *Memorial* was vague in places, and ignored some significant areas of the Garden's work, such as the reception, propagation and distribution of plants both from within India and from overseas. It also neglected the need to record and make available knowledge of the Indian flora by means of paintings and publications. But the writer was clear in stressing how important it was that the Superintendent should be well qualified as "The Botanical Garden is the highest scientific appoint(*ment*) which can be held by any of the medical service."⁸³ He therefore reiterated the need to reverse the 1830 decision to reduce the superintendent's emoluments when Wallich retired. The Directors of the East India Company were persuaded by these arguments put to them by Royle and others, and made the crucial decision to maintain the Superintendent's salary at Rs.1,500 per month.⁸⁴

Desmond is almost certainly correct as the *Memorial* repeats many phrases used by Royle in his *Observations on the Calcutta Botanic Garden and the appointment of a successor to Dr Wallich* dated 13th June 1846 (BL Board Collections F/4/2186 no. 106661).

⁸¹ Memorial on Calcutta Botanic Garden para. 1.

⁸² Memorial on Calcutta Botanic Garden para. 4.

⁸³ Memorial on Calcutta Botanic Garden para. 10.

⁸⁴ About £150 (£1,800 pa) at the time. An approximate modern equivalent would be £15,000 per month. It was very high by contemporary British standards, but comparable to the salaries drawn by other senior members of the Indian Medical Service.

Falconer was still on leave in Britain when he was appointed in 1846, and he did not reach India until 1848. John M'Clelland was therefore appointed to take temporary charge. The Directors' approval of Griffith's 1844 report meant that M'Clelland felt justified in continuing Griffith's work, trying to make the Garden better focussed and more accountable.⁸⁵ He wrote a report in 1846, and included three maps of the Garden to illustrate Griffith's plans and achievements (see Chapter Five). Using maps as a point of comparison over time was a new way of conceptualising the Garden, in keeping with the statistical approach of M'Clelland's generation. Wallich had mapped his travels, but did not prepare any maps of the Garden.

Ironically, Wallich had allied himself with the new reforming spirit when he supported the changes at Kew. In 1841 Sir William Hooker had written 'You cannot yet have heard that I have lately been put in charge of the Royal Botanic Gardens of Kew..... I hope greatly to improve the Garden and make it available to the public good.'⁸⁶ In reply Wallich wrote 'I rejoice at my auspicious renewal of my intercourse with you & with her Majesty's Garden at Kew. Be assured that everything a man can do shall be done towards enriching your noble and most justly celebrated garden.'⁸⁷ Wallich's choice of language was interesting: he still seemed to be thinking in terms of sending spoils from India to enrich Kew, rather than collaborating to advance the investigation of the flora of South Asia. Wallich did not fully appreciate what the change of regime at Kew meant. In 1838, John Lindley, one of Britain's leading botanists, wrote a report⁸⁸ on the future of Kew (see Chapter One). The Report listed Calcutta first when it argued for organisational change in the imperial network. Griffith, who had been John Lindley's student at University College, London, ten years earlier, understood much more clearly than Wallich that botanic gardens in future would need to be better organised and more accountable. Once he was installed at Kew Sir William Hooker was able to build on botanists' feelings of loyalty

⁸⁵ As a friend and admirer of Griffith, M'Clelland was determined to secure his reputation. He gave up producing *The Calcutta Journal of Natural History* at this time, and devoted several years to organizing and publishing Griffith's notes and papers. See Noltie, *The Life and Work of Robert Wight*, I, 97, for the value of that work.

⁸⁶ CNH Kolkata Archives, Wallich letters: Sir William Hooker to Wallich, 27th April 1841.

⁸⁷ CNH Kolkata Archives, Wallich letters: Wallich to Sir William Hooker, 27th December 1841.

⁸⁸ British Parliamentary Papers. House of Commons Accounts and Papers, No. 292, Vol. XXIX.259, (1840). *Report made to the committee appointed by the Lords of the Treasury in January 1838 to inquire into the management and present condition of the Royal Gardens at Kew, with Recommendations for its Future Administration*, by Lindley, John, and others, No. 4 of Royal Gardens Committee, 1838. John Lindley was Professor of Botany at University College, London.

to their science, and their desire to communicate in botanical terms, and begin to consolidate their growing network into a system for coordinating the British imperial botanical enterprise.⁸⁹

Joseph Hooker, at that time assisting his father, Sir William, would become the main coordinating figure of that network. Joseph Hooker greatly respected Griffith's scientific abilities,⁹⁰ but not his confrontational attitude. As Jim Endersby has pointed out, Joseph wanted botany to become a respectable profession, and felt that botanists would only earn respect if they behaved like gentlemen.⁹¹ That did not exclude controversy, but he objected to the public attacks that Griffith and McClelland made on Wallich.⁹² Joseph Hooker was very anxious to see more progress in documenting the Indian flora. He feared that public squabbling would reduce the credibility of botanists, and consequently their access to resources for their enterprise in India.⁹³ He was also worried that Griffith appeared to be insufficiently concerned about the appearance of the Garden, at a time when he and his father were realising that Kew must be attractive in order to get public support.⁹⁴

McClelland was still looking after the Garden in January 1848 when Joseph Hooker reached Calcutta. Having failed to find a post as a botanist in Britain, Hooker concluded that he should get more field experience, particularly of the tropical flora. He planned a two-year visit to India, though he ended up staying in for three years. He hoped ultimately to achieve a position similar to his father's, coordinating the imperial network, so it made sense for him to get to know the plant life of India, which was by far the most populous and diverse of the British overseas possessions. India was also large, and centrally situated at a point where the floras of western Eurasia, Russia, China and Southeast Asia met, so it was a good place for him to explore the emerging discipline of botanical geography.

⁸⁹ Ibid. 201-206.

⁹⁰ In Huxley, *Life and Letters of Sir J. D. Hooker*, i, 235, Joseph Hooker is reported as saying, 'I am perfectly amazed at Griffith's powers. His exertions were all but superhuman ...' This judgement is repeated in the Introduction to *Flora Indica*, 62, which states 'Our own opinion of Mr Griffith's exertions and botanical attainments is, that he has never been surpassed in India.'

⁹¹ See Chapter Nine "Associating" in Endersby, *Imperial Nature*.

⁹² Arnold, *The Tropics and the Travelling Gaze*, 175.

⁹³ Endersby, *Imperial Nature*, 272-75.

⁹⁴ Arnold, *The Tropics and the Travelling Gaze*, 175.



Figure 13. Joseph Hooker in the 1850s.

Naturally Hooker visited the Botanic Garden, and gave his views on it. He mounted a lively defence of its work, surprised that many people in Calcutta looked on it as ‘...rather an extravagant establishment, more ornamental than useful.’⁹⁵ He pointed out that:

...its name was renowned throughout Europe, and that during the first twenty years especially of Dr Wallich’s superintendence, it had contributed more useful and ornamental tropical plants to the public and private gardens of the world than any other establishment before or since.⁹⁶

Hooker’s highlighting of the first twenty years of Wallich’s superintendence suggests that he sympathised with those who felt that less was achieved after 1833. However, when Hooker returned to Calcutta in 1850, after his expedition to Sikkim, and he paid another visit to the Botanic Garden, and complained bitterly that:

The destruction of most of the palms, and of all the noble tropical features of the gardens, during Dr Griffith’s incumbency, had necessitated the replanting of the greater part of the grounds, the obliteration of old walks, and the construction of new;⁹⁷

⁹⁵ Joseph Hooker, *Himalayan Journals*, (London, 1855), I, 3.

⁹⁶ *Ibid.*, I 3.

⁹⁷ *Ibid.*, II, 249-50.

The avenue of Sago-palms, once the admiration of all visitors, had been swept away by the same unsparing hand which had destroyed the teak, mahogany, clove, nutmeg and cinnamon groves.⁹⁸

Much has been made of these comments,⁹⁹ but they may have exaggerated the damage, particularly as there had been a cyclone in 1843. Thomson was impressed by the appearance of at least parts of the Garden when he arrived as Superintendent in 1855 (see below). Nearly twenty years after Griffith acted as superintendent, Anderson, who took over the Garden in 1861, discussed the great difficulties of introducing necessary but wholesale change in the Botanic Garden, and was understanding of Griffith's approach.¹⁰⁰ It is true, however, that Griffith had little experience of nursery work, and so lacked the skills that Wallich had developed in successfully nurturing plants (see Chapter Five).

Joseph Hooker's visit to India was a key event, and the beginning of a sixty-year relationship.¹⁰¹ The thorough knowledge he acquired of the Indian flora, and his subsequent publications, constituted an important link between Indian botany and mainstream Victorian science. Before his visit to Britain in 1828, Wallich appeared to British botanists as a remote expert with unique access to the Indian flora. But after 1846 every superintendent of the Calcutta Botanic Garden spent some time working at Kew, either before his appointment or shortly after. Joseph Hooker was later able to draw on the field knowledge of several botanists who had worked in India, particularly when he was working on *The Flora of British India*.¹⁰² So Wallich's successors functioned much more as collaborators with similarly knowledgeable colleagues at Kew, and not as remote and peripheral, though expert, figures. By the time of Hooker's second visit to Calcutta, Hugh Falconer had taken over as Superintendent. Falconer had previously been Superintendent of the Saharanpur Botanic Garden, near Delhi, so he knew what managing a botanic garden involved. It has been argued that he was by this stage more interested in palaeontology than in

⁹⁸ Ibid., II, 249-50.

⁹⁹ They are, for instance, quoted in both Arnold, *The Tropics and the Travelling Gaze* (p. 175) and in Desmond, *The European Discovery of the Indian Flora* (p. 96).

¹⁰⁰ RBG Kew Archives: Annual Report on Calcutta Botanic Garden, 1867-68.

¹⁰¹ Hooker died in 1911 at the age of 94. He was still taking an interest in the Indian flora, and writing on the genus *Impatiens*, until shortly before his death.

¹⁰² Thomas Anderson, Thomas Thomson, George King, C. B. Clarke, Stewart, George Watt and John Duthie all spent time working with Joseph Hooker at Kew between 1869 and 1900.

botany,¹⁰³ but he had had quite a lot of contact with Kew between 1843 and 1847, whilst he was on home leave.

Once established in Calcutta, the *Memorial on Calcutta Botanic Garden* provided a useful manifesto for Falconer, but in the event he did little to press the rest of the case, so the library allowance was not restored and the herbarium collection did not increase much. Falconer did, however, work hard to improve the appearance of the Garden. In 1854 he also recommended that the free distribution of plants from the Garden should cease.¹⁰⁴ That was a more important matter than it might seem as, according to Thomson, Falconer's successor, it tied up about a fifth of the Garden's workforce. Thomson was able to redeploy them to higher priority tasks when the change was implemented in 1857, after Falconer's departure.¹⁰⁵ It marked the beginning of a retreat from Wallich's efforts to promote British horticultural practices in India and a move away from the priorities of the Agri-Horticultural Society. Falconer was also a competent economic botanist and produced an important report on the teak forests of Tenasserim.¹⁰⁶ Otherwise, however, Falconer's time in Calcutta was a disappointment to those who hoped that he would bring a new sense of purpose to the Garden. By the 1850s his early enthusiasm for botany had diminished, and he did not do much to make the flora of India better known by publishing. His departure from India in 1855 was not a major blow to the Garden, and he focussed on his palaeontological work during his retirement.¹⁰⁷

A more important event in 1855 was the appearance of volume one of Hooker and Thomson's *Flora Indica*. Joseph Hooker had started writing as soon as he returned to Britain in 1851, collaborating with Thomson (who was home on sick leave), to start a comprehensive account of the plants of India.¹⁰⁸ The *Flora Indica* was planned as the authoritative guide that would describe all the plants growing in the region controlled

¹⁰³ Ibid., 157.

¹⁰⁴ BL IOR F/4/2695 No. 190938: Report by Dr Thomson dated 24th Sept 1856, para. 4.

¹⁰⁵ Ibid., para. 25. The Garden did in fact continue with some more specialised work such as orchid growing.

¹⁰⁶ BL IOR Bengal Selections V/23/92 No. 9.

¹⁰⁷ Arnold, *The Tropics and the Travelling Gaze*, 157.

¹⁰⁸ Hooker and Thomson revived their youthful friendship and collected together in the Khasi Hills in 1850.

by the East India Company.¹⁰⁹ Shortly before the first volume was published Thomson returned to India to replace Falconer as Superintendent in Calcutta. The plan then was for Thomson and Hooker to continue the work from their respective bases in Calcutta and London. However Thomson did not have the necessary time or energy, and no further volumes appeared.

Neither Hooker nor any of the superintendents in Calcutta ever envisaged such a major centre-periphery publishing collaboration again,¹¹⁰ and it is unlikely that any superintendent could have coped with the sustained amount of work that would have been involved.¹¹¹ Nevertheless, volume one of the *Flora Indica* is a key work, and a classic of mid-Victorian science, because of its 270-page introduction, largely written by Hooker. In it he outlined many of the issues facing botanists, including problems of geographic distribution, dispersal and competition amongst plants, soon to be further elucidated by Darwin. By addressing these ‘philosophical’ problems,¹¹² Hooker attempted to raise the status of botany, and by focussing on botanical geography, he introduced a new way of conceptualising India, presenting the sub-continent as a series of botanic zones.¹¹³

In the introduction to the *Flora Indica*, Hooker included practical advice for anyone wanting to study the Indian flora. It was a serious stocktaking exercise aimed at injecting new life into botany in India. It surveyed everything that had been published before 1855, listed all the significant collectors and outlined the herbarium material available for study. Hooker argued that scientific investigation must underpin all other research:

Our work is intended to facilitate the progress of economists, by supplying their great desideratum, a critical description of the plants which yield the products they seek. We have had a considerable experience both in medical and economic botany, and we announce boldly our conviction, that, so far as India is concerned,

¹⁰⁹ Arnold, *The Tropics and the Travelling Gaze*, 38.

¹¹⁰ There were however some more modest publishing collaborations with Kew in the 1890s, when there were more botanists in Calcutta and communications were much better.

¹¹¹ Hooker was, however, determined that the project should be completed, and in the 1870s he returned to the task. Working with botanists with Indian experience, such as C. B. Clarke, who were seconded to Kew, Hooker did succeed in producing a comprehensive new work, the seven-volume *Flora of British India*, between 1872 and 1897.

¹¹² See Endersby, *Imperial Nature*, 41 and 216-18, for a discussion of the importance that Hooker attached to these issues.

¹¹³ Endersby, *Imperial Nature*, 245.

these departments are at a standstill, for want of an accurate scientific guide to the flora of that country.¹¹⁴

Behind that statement lay Hooker's hope that careful scientific examination of the patterns of vegetation across the world would enable botanists to understand the 'laws' that governed plant distribution.¹¹⁵ As a result botanists might be able to predict where useful plants could be grown, in the same way that geologists were already predicting where gold, or coal, might be found.¹¹⁶

Hooker thus presented the work of the Botanic Garden as an integrated whole rather than competing scientific and economic projects (see Chapter Four). His feeling that the medical and economic departments were at a standstill was understandable. Little serious botanical work was being done in India in the mid 1850s. The modest collection in the herbarium was poorly looked after and disorganised, Wight had left south India with his publishing project incomplete, and Falconer's successor in Saharanpur, William Jameson, 'Not being a botanist, ... devoted his energies to raising horticultural and agricultural plants.'¹¹⁷ Hooker desperately wanted to revive the scientific enterprise. If Griffith's 1844 report set the agenda for improving Calcutta Botanic Garden, then, eleven years later, Hooker was making a similarly impassioned plea for organising and publishing the accumulated knowledge of the Indian flora.

In 1855 Joseph Hooker became Assistant Director of Kew Gardens, and subsequently Director when his father died in 1865. Hooker's knowledge of India became very significant: until the 1850s decisions about the Calcutta Garden were taken by the East India Company, but Hooker built on Forbes Royle's pioneering work. He used Kew's increasing authority to put forward proposals for surveys of colonial plants and the publication of floras, as well as making nominations for botanical and gardening posts. After 1860 few botanical appointments were made in India (or in the rest of the imperial network) without his advice.¹¹⁸ That complicated the position of the superintendents in Calcutta, but also gave them a sense of power

¹¹⁴ J. D. Hooker and Thomas Thomson, *Flora Indica* (London, 1855), Introductory Essay, 3.

¹¹⁵ Endersby, *Imperial Nature*, 17.

¹¹⁶ *Ibid.*, 18.

¹¹⁷ Desmond, *The European Discovery of the Indian Flora*, 111.

¹¹⁸ MacCracken, *Gardens of Empire*, 182.

and responsibility as part of a global botanical community. They did not always agree with the Hookers and their successors, and Kew's advice was not always followed by the Government of India.¹¹⁹ Generally, however, the arrangement worked without much friction, and provided additional drive and direction for the botanical enterprise in India.

The recovery of a scientific capability: Thomson and Anderson as superintendents

Hooker's friend and collaborator, Thomas Thomson, took over as Superintendent in April 1855. As he had been a candidate in 1846, and had the support of Sir William Hooker, as well as nine more years of valuable experience, there was little dispute that he should have the job. He had travelled widely in India and Afghanistan and had a better overview of the flora of the region than almost anyone else. Thomson was the first superintendent in Calcutta who owed his job to Kew, and with his longstanding connections with the Hooker family, he was very much Kew's man.

Thomson's priority was to reinstate the capability of the Garden to act as a base for taxonomic science. One of his initial actions was to start combining into a single reference collection the various herbaria that had accumulated in Calcutta since Wallich removed the original one in 1828.¹²⁰ That was a major task and took much of his energy. Well aware that the materials available were still not adequate for any serious study of the Indian flora, he wrote a journal article, *Notes on the Herbarium of the Calcutta Botanic Garden, with special reference to the completion of the Flora Indica*,¹²¹ to seek collaboration. He provided a clear and concise summary of progress so far in recording and publishing the Indian flora. Like his predecessors, Thomson regretted that Wallich had not retained a set of duplicate herbarium specimens in Calcutta, and that no copies were made of the drawings done by the Garden's artists between 1815 and 1828. In his article, Thomson asked for help from botanically inclined readers in India.¹²² It is doubtful whether Thomson received much material as he was writing

¹¹⁹ The Government of India rejected Joseph Hooker's attempt to get the Superintendent's post redesignated 'Director', for example (see Chapter Four).

¹²⁰ Thomson, Thomas, 'Notes on the Herbarium of the Calcutta Botanic Garden, with special reference to the completion of the Flora Indica', *Journal of the Asiatic Society of Bengal*, Vol XXV, V (1856).

¹²¹ Ibid.

¹²² Ibid., 1.

less than a year before the 1857 uprising, but he had sown a seed in the minds of other botanists. After the uprising, material did begin to arrive, and Calcutta gradually developed a new herbarium collection.

Whilst botanists in India had always collaborated informally, mainly by letter writing and the exchange of plants and specimens, Thomson's article is the first example of a superintendent in Calcutta assuming a formal leadership role and trying to coordinate the efforts of all his fellow investigators. It is thus a first indication of the push for a more collaborative network, which would culminate with the establishment of the Botanical Survey in 1890. In September 1856 Thomson reflected at much greater length on the role and priorities of the Garden when he submitted his first Report to the Government. It is one of the most useful reports we have as it identified many of the challenges facing the Garden. Thomson began by noting that the 1830 budget cuts had restricted the progress of the Garden ever since, and he admitted that 'little progress has been made in the Garden notwithstanding all the efforts of many superintendents.'¹²³ He identified the gratuitous distribution of plants as a major constraint, and said it had been 'a matter of extreme difficulty to prevent the Garden from having the appearance of what it is in reality – a gigantic nursery garden.'¹²⁴

Thomson, fresh from his time at Kew, was adept in arguing for support. He wrote:

Twenty years ago it might have been necessary to enter into debate in order to prove the importance of a Botanic garden. At the present day the value of such an establishment is no longer a matter of doubt, and the necessity for such an institution in the metropolis of a great empire which is also the seat of a nascent university, will probably be conceded by everyone.¹²⁵

He was also the first to put forward a new purpose for the Garden by stressing the potential 'civilising' and 'sanatory'(*sic*) benefits that it might bring to a rapidly expanding Calcutta, concluding that, 'To make the Botanic Garden an establishment worthy of the empire, its scientific character ought to be raised and it ought to be made available as a place both of instruction and recreation.'¹²⁶

¹²³ BL IOR F/4/2695 No. 190938: Report by Dr Thomson dated 24th Sept 1856 para. 23.

¹²⁴ Ibid, para. 24.

¹²⁵ Ibid, para. 26.

¹²⁶ Ibid. para. 30.

He went on to cite Kew as an exemplar, saying, 'What Kew is to the Metropolis of England the Calcutta Botanic Garden might be and ought to be made with respect to the metropolis of India.'¹²⁷ Kew was now a well-established and increasingly prestigious institution in Britain, and was beginning to provide a model that could be used by colonial botanists, so Thomson introduced for the first time the 'Kew of India' ideal. Kew had received major investments, and was establishing itself as a coordinating point for all the botanical activities within the Empire.¹²⁸ Calcutta never came near to emulating the role of Kew, but the idea of 'The Kew of India', or even 'The Kew of the East', was to be a potent vision over the next fifty years as successive superintendents worked to improve the Garden, and sought to maintain its pre-eminence in South and East Asia. Unfortunately, having gone some way to outlining a vision for the Garden, Thomson's recommendations were more mundane, and not likely to advance the scientific purposes of the Garden in any significant way. Encouragingly though, the Governor General, Lord Canning, wrote in reply to a letter from Sir William Hooker a month later saying 'I have been greatly gratified both by the Gardens themselves, and by the interest which Dr Thomson takes in his charge.'¹²⁹

With an imaginative Superintendent, a supportive governor general and strong links to Kew, it seemed as if the Garden would finally be able to resume progress investigating and recording the flora of India, and again become a significant contributor to the global exchange of plants. But once more the Garden was overtaken by events. The 1857 uprising meant that Lord Canning was preoccupied for the next year with the most serious threat ever faced by the British in India, and then with pacification, so there was little time to think about the development of the Botanic Garden. By 1859, when the uprising was over, Thomson was ill, and he had to leave India early in 1861.¹³⁰

Thomson's successor was another Scottish IMS officer, Thomas Anderson. After active service as a surgeon during 1857-58 he had been invalided back to Britain, where he worked at Kew before returning to India in 1861, initially as acting

¹²⁷ Ibid. para. 27.

¹²⁸ Drayton, *Nature's Government*, 180-88.

¹²⁹ RBG Kew DC 54: Viscount Canning to Sir William Hooker, 8th Oct 1856.

¹³⁰ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 21st March 1861.

superintendent.¹³¹ Anderson was another representative of the new scientific culture. Like Griffith he was able and energetic, and eager to see the Botanic Garden fulfil its potential. Falconer had not collaborated very closely with Kew, and Thomson's illness and declining energy meant that there was little scope for joint initiatives. With Anderson's arrival in Calcutta in 1861, however, letters were exchanged every month or so.¹³² He and Hooker developed a close working relationship, even though Hooker was fifteen years older and clearly the more authoritative partner. Hooker's authority was reinforced when he became director of Kew in 1865, and that enabled him to increase his influence on the trajectory of the botanical enterprise in India.

Hooker's relationship with Anderson was inevitably different to that with Thomson, who was an old school friend, even though Hooker had gradually realised that Thomson's powers were in decline. When he first arrived, Anderson wrote: 'Thomson is well aware of the unsatisfactory condition of everything but he has been unable to contend against the no. of abuses that require reform.'¹³³ He was quite correct in thinking that Thomson's powers of analysis were more impressive than his ability to get things done. In the same letter Anderson noted Thomson's good work in organising the herbarium, but quickly realised that the Garden's finances were in disorder. Shortly after he arrived, Anderson went with Thomson to call on the Lieutenant Governor of Bengal. Anderson used the opportunity to make the case for extra money to increase the European gardener's salary, to start rebuilding the library and to house the herbarium. These funds were granted a year later,¹³⁴ so, for the first time since 1830, the Garden got some additional resources.

The situation that Anderson found himself in was not dissimilar to that of Griffith twenty years before, and Anderson plunged in with almost equal vigour. He found the seed house in chaos, full of unanswered applications and unsent packets of seeds. He was ruthless, writing a month after his arrival, that 'I have already got rid of lbs. 1500 of old letters.'¹³⁵ He also built on the work that Thomson had done in the

¹³¹ Anderson became substantive Superintendent in 1862.

¹³² The Kew Archives have 95 letters from Anderson written between 1861 and 1870.

¹³³ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 21st March 1861.

¹³⁴ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 9th March 1862.

¹³⁵ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 22nd April 1861. It appears that these letters were mainly proforma applications for seeds etc., and not the main archive of the Garden as has sometimes been suggested.

herbarium, and began a catalogue of the plants in the Garden. The sheer hard work of getting the herbarium into a useable state illustrates how the practicalities of their work impacted on botanists. Anderson found that the herbarium specimens could only be consulted with great difficulty. They generally had some information attached, but they were kept in disorganised bundles. They were being attacked by insects, and quite a number had been destroyed. To remedy the situation the specimens first had to be ‘poisoned’ to prevent further insect damage, then glued down onto standard-sized sheets with the relevant information, and finally put in order in cabinets where they were readily accessible.¹³⁶

Writing in 1861 Anderson explained what this involved: ‘To get it (the herbarium) into the state it is now in Thomson has worked from morning till late at night (often after dinner) for six years’.¹³⁷ Anderson decided to finish the work in spite of all his other tasks, which included re-planting the Garden, setting up the cinchona plantations and delivering fifty lectures a year at the Medical College. The growing global interconnectedness is reflected in the fact that some of his best paper came from Asa Gray, the Professor of Botany at Harvard, literally on the other side of the world.¹³⁸ By 1865 Anderson was writing that he was heartily tired of the task of gluing down and sorting the specimens, but the work was completed in 1866 and the herbarium was installed in new cabinets in a new building.¹³⁹

Anderson had plenty else to keep him busy during his first few months. He started replanting parts of the Garden, establishing groups of trees so that similar species were near each other, and would be less vulnerable in high winds. He set targets for the artists at the Garden, and started labelling the plants again. Anderson also began reforming the accounting and administrative systems. By September 1861 he was saying that he was getting on famously, though he ‘still abused Falconer and Thomson for doing so little good work’.¹⁴⁰ He felt that the reputation of the Garden had sunk so low that the Government no longer automatically consulted the

¹³⁶ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 21st March 1861.

¹³⁷ Ibid.

¹³⁸ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 8th July 1863.

¹³⁹ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 15th January 1866.

¹⁴⁰ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 9th September 1861.

Superintendent on botanical matters. He set out to change that, and made sure that the Governor General, Lord Canning, paid a visit.¹⁴¹

In October and November 1861 Anderson visited Buitenzorg, in the Dutch East Indies. The main purpose was to look at the Dutch cinchona growing operation, and on his way back he visited the south Indian cinchona plantations, which were already being established in the Nilgiri Hills in South India. He was now convinced that cinchona would grow in Sikkim as well, and he seized that opportunity to make the Botanic Garden more relevant, and to establish his own botanical reputation (see Chapter Five).¹⁴² Anderson spent much of 1862 in Sikkim setting up the operation. Considerable numbers of workers were needed, including, ultimately, some five or six European gardeners and overseers.¹⁴³ That increased the management charge of the Superintendent, although it did also provide a modest base for growing temperate plants, and the opportunity to make regular visits to Sikkim, where the climate was pleasanter for Europeans.

As we have already noted in Chapter One, Anderson was able to take advantage of another opportunity in Java, and negotiate with Sulpiz Kurz, a knowledgeable German working at Buitenzorg, about moving to Calcutta. Anderson was able to get funding in 1864 and Kurz became the first Curator of the Herbarium. Kurz stayed until he died thirteen years later. The following year John Scott was appointed Curator of the Garden – i.e. Head Gardener, and he stayed for fifteen years. He had far greater botanical skills than any of his predecessors and was elected a Fellow of the Linnean Society in 1873.¹⁴⁴ By making these two appointments Anderson transformed the capabilities of the Garden, and for the first time, the Superintendent had professional botanical backup. From this point the herbarium developed as a real scientific resource, and its work did not come to a halt every time the Superintendent was absent.

¹⁴¹ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 13th December 1861.

¹⁴² RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 9th March 1862.

¹⁴³ West Bengal State Archives, General Department PV, Anderson to Government of Bengal requesting extra funds for establishing Sikkim cinchona plantation, 26th November 1863.

¹⁴⁴ [http://en.wikipedia.org/wiki/John_Scott_\(botanist\)](http://en.wikipedia.org/wiki/John_Scott_(botanist)) accessed on 27th September 2014.

Apart from establishing cinchona growing, Anderson's focus was on improving the Garden's scientific capability, as outlined at the beginning of this chapter, though in November 1862 he still thought that it would take five years to create a 'working scientific establishment.' To signal his focus on science, Anderson started setting aside particular areas of the Garden for replanting with the different natural orders. In 1864 he decided that he needed more space for a garden specifically for annual herbaceous plants, which would be grown in rows for study and seed production. He therefore asked the Agri-Horticultural Society to give up half of the twenty acres it occupied.¹⁴⁵ The detailed implications of that decision are discussed in Chapter Five. It was initially controversial but ultimately it probably benefitted both organisations.

Anderson was also inspired by his visit to Buitenzorg to redesign the Garden, and he outlined his plans in his Annual Report in 1862. He intended to build on the work of Falconer, who had grouped all the palms in one area, and of Thomson, who had added other monocotyledons such as bamboos to this grouping. He hoped ultimately to achieve what Griffith had attempted, but by less drastic means. Unfortunately progress in redesigning the Garden was interrupted by the cyclone that struck the Garden in 1864¹⁴⁶. The whole Garden was flooded with brackish water, some half of all the trees were blown down and several buildings were extensively damaged. Anderson was initially depressed, writing:

It puts me in the lowest spirits & I feel perfectly helpless whenever I go out in to the garden. The rash clearances made by Griffith gave full entrance to the storm to the innermost corner of the Garden. Wherever trees were well massed many escaped.¹⁴⁷

Shortly after however, he wrote: 'The accounts sent home from this & which we are now seeing in the Home papers are much exaggerated.'¹⁴⁸

¹⁴⁵ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 22nd February 1865.

¹⁴⁶ This cyclone was a major natural disaster for Bengal: it was thought that at least 60,000 people died.

¹⁴⁷ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 8th January 1865.

¹⁴⁸ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 22nd February 1865.



Figure 14. Calcutta awash: watercolour by John Arthur Armstrong showing Calcutta from the Strand during the cyclone of 5 October 1864. (© The British Library Board, no. WD4244).

Anderson tried to get extra funds for a report on the trees that were blown down, but the money was withheld at the last minute by the Governor General, prompting a biting response by Anderson: ‘Sir John Lawrence has as much like of science and the duties of the director of a Botanic Garden as any one of his native bodyguard.’¹⁴⁹ Such forthright criticism gives us an idea of how much more confident scientists in India felt by the 1860s – it is inconceivable that Wallich would have written in that way.

Fortunately an unsympathetic Governor General no longer mattered so much. With the ending of Company rule in 1858 the status of the Garden had changed. It was renamed the Royal Botanic Garden, and the Superintendent reported to the Lieutenant Governor of Bengal. Building on the good relations that resulted from being in closer proximity to senior officials, and with well thought out plans, Anderson was much more successful in acquiring new resources than any of his predecessors had been. Writing to Joseph Hooker in 1866 Anderson expressed pride

¹⁴⁹ Ibid.

in how his botanical practice had succeeded in greatly enlarging the range of plants grown:

You complain of the few species in this garden...the garden has been at a standstill since Wallich left for the Cape 25 years ago ... When I took charge in 1861 I suppose there were about 2000 species in the Garden; now there are 5500 species in the mss. catalogue I confess I am now proud of the Garden¹⁵⁰

However, there was a further setback in 1867 when the Garden lost another 750 trees to a cyclone.¹⁵¹ There was much clearing up and for six months in 1868 Anderson hoped that the Garden could be moved to a less exposed and more convenient site on the Calcutta side of the river. In the end the Lieutenant Governor decided that he could not justify the expense so activity resumed in the Garden (see Chapter Six).¹⁵²

By the end of 1868 Anderson had completed the restoration of Thomson's herbarium, obtained funds for the library and produced a catalogue of plants. These successes, and especially his recruitment of Sulpiz Kurz and John Scott, had restored the Garden's capability as a 'working scientific establishment'. He and Scott had also much improved the Garden's cultivation practices and expertise in acclimatising exotic species. A Calcutta newspaper reported enthusiastically: 'Indian gardening has taken wonderful strides during the past two or three years, and plants are now cultivated, which Falconer or Wallich would never have dreamed of keeping in Lower Bengal.'¹⁵³

Anderson and his colleagues laid the basis for Calcutta to become a 'centre of calculation' again, able to collect, sort and analyse scientific material, and build on it to create new knowledge. That enabled him to develop his networks of exchange with other botanic gardens. A good example of Calcutta becoming a node in the international network was Ferdinand von Mueller asking Anderson to transmit specimens from Melbourne to Buitenzorg in Java, as von Mueller had no direct link

¹⁵⁰ RBG Kew DC 155 Indian letters: Anderson to Joseph Hooker, 22nd April 1866.

¹⁵¹ RBG Kew MR 226: Report on the Condition of the Royal Botanical Gardens, Calcutta from 1st April 1867 to 31st March 1868.

¹⁵² RBG Kew DC 155: Indian letters: Anderson to Joseph Hooker, 27th August 1868.

¹⁵³ *The Englishman*, Calcutta, editorial, 9 January 1869.

himself.¹⁵⁴ Anderson had also succeeded in setting up an effective cinchona growing operation in Sikkim, with the potential to enhance the Garden's reputation for providing medicinal and economic benefits. If it had not been for the cyclones he would also have left the Garden itself much better landscaped and organised than he found it. He even found time to write papers on the *Acanthaceae*, his particular botanical interest. The Garden had finally recovered from the state Wallich had left it in, but Anderson's days in India were now numbered.

The annual report for 1869-70 mentioned a further cyclone in June 1869, which destroyed some of the few remaining old trees, as well as blowing down avenues of palms, but concludes:

The damage done by this storm was nevertheless mainly of a temporary nature. When Dr T Anderson's design shall have been completed, and the trees have grown up into solid masses as in Dr Wallich's time, I doubt whether the garden need fear much from typhoons.¹⁵⁵

That was written by Anderson's temporary successor, C. B. Clarke. Anderson had been invalided home in February 1869. Clarke was right: there was no more severe cyclone damage, and the Garden did recover. In a sense these storms were symbolic. They were blowing themselves out at the same time as the controversies initiated by Griffith were finally being brought to an end by Anderson's creation of the 'working scientific establishment' that the reformers had wanted.

Conclusion

The controversies in the 1840s were about what sort of Garden there should be, and how the new natural orders should be displayed. For Griffith there was a certain triumphalism in demonstrating the natural orders, and the end of the old Linnaean system. But the controversies were also about different approaches to science, and whether India would have a proper scientific centre for botany with a comprehensive herbarium, library and collection of paintings to back up the order beds.

¹⁵⁴ RBG Edinburgh Archives Anderson Correspondence 168: von Mueller to Anderson, 24th May 1867.

¹⁵⁵ RBG Kew MR 226: Report of the Calcutta Botanical Gardens from 1st April 1869 to 31st March 1870, para. 10.

All of Wallich's successors wanted that, but it turned out to be more difficult than expected to achieve. The Botanic Garden, as an exemplar of colonial science, showed how real progress depended on a conjunction of favourable factors, and frequently between 1833 and 1861 it was held back by lack of funding, inadequate management or simply a superintendent in poor health. Neither Wallich, nor Griffith, nor Falconer, nor Thomson, had quite the range of skills needed to be a really successful superintendent. Anderson did much, but he was overcome by ill health and died shortly after he left Calcutta, still only thirty-eight years old. So this survey of the Garden's second forty years ends without any guarantee that its future could be secured after so many changes and difficulties. Even so, the Garden had changed much between 1833 and 1871. Those four decades coincided with the great Victorian enthusiasm for natural history, including botany.¹⁵⁶ That enthusiasm had helped the Hookers to build up Kew as a national and international centre for botanical investigations. Joseph Hooker's particular interest in India after his visit in 1848-51 meant that he had a special concern to ensure that the flora was properly recorded, and that the Botanic Garden made a significant contribution to the emerging British imperial scientific network.

At the same time British administrators were coming to regard science and technology as increasingly useful supports for their rule in India. That was partly because of their successful efforts to manipulate the physical environment: communications had greatly improved as a result of the introduction of steamships, railways and the telegraph. Those technologies hardly existed before 1833 but were becoming commonplace by 1871. The contribution of geologists to the growth of coal mining, and the achievements of civil engineers in canal and bridge building similarly reinforced the belief in technology. British confidence relied partly on a growing belief in the superiority of British science and technology, so there was a greater official willingness to support scientific establishments in the 1860s than there had been in the 1830s.¹⁵⁷ In its turn, the Government's willingness to support them reinforced the growing confidence of scientists, in India and elsewhere.

¹⁵⁶ Allen, *The Naturalist in Britain*, chs 5 & 9.

¹⁵⁷ Arnold, *Science, Technology and Medicine*, 121-34.

The focus of the Garden changed a good deal over the period. Under Thomson and Anderson it moved decisively away from being a ‘gigantic nursery.’ The relaxed régime of the East India Company that had allowed Wallich to delay his reports for years and let the Garden slip into administrative confusion had disappeared by the 1860s. The Government of India demanded properly formulated and timely annual reports, detailed financial accounting and comprehensive records. For the rest of the colonial period the Garden would have to function in this disciplined bureaucratic environment. The people that the Garden related to in India changed too. The social and working relationships that Wallich had with Bengali community leaders in the 1820s and 1830s were not replicated by any of his successors. The only prolonged contact was with the students at the medical college, but the superintendents generally regarded their lectures as a chore, and a diversion from their ‘real’ scientific work.¹⁵⁸

Although it had finally brought together the staff and facilities to become ‘a working scientific establishment’ by the end of the 1860s, the Garden had not yet realised its potential, nor fulfilled all the expectations of its sponsors. Faced with devastating famines in the 1860s the Government of India hoped for renewed efforts to make India’s agriculture more productive. There was also a need for the Garden to take on a coordinating role for all the botanical work being done in India, and to increase its research and publishing output in order to win respect within the global botanical community. Finally, there was doubt about whether the Garden was in the right place. There were still multiple challenges for Anderson’s successors.

¹⁵⁸ RBG Kew DC: Thomson to Sir William Hooker, 9th August 1855 and Anderson to Joseph Hooker, 9th March 1862.

Chapter Four

The culmination of the taxonomic project and changing government expectations, 1871-1914

Thomas Anderson's unanticipated departure in early 1869 led to several years of uncertainty about the future direction of the Garden, and the long period of stability under Anderson's substantive successor, George King, did not finally start until the end of 1873. After that, however, King was able to complete Anderson's drive to make the Garden 'a working scientific establishment'. King proved to be very competent, and he soon won the agreement of fellow botanists and the authorities on what a botanic garden should look like, and how it should be conducted. Consequently, in the late nineteenth century, there were none of the dramatic controversies or changes of policy that characterised the era of Wallich and Griffith. This chapter will focus on how the Garden finally provided the institutional environment that allowed the taxonomic project to come to fruition. Nearly all botanists were agreed that it should be their priority, and they achieved their overall objective to a large extent with the completion of Joseph's Hooker's *Flora of British India* in 1897.

The Government of India was initially willing to support the taxonomic project, and provided a subsidy for the publication of the *Flora*. Over time, however, the need to improve the productivity of Indian agriculture emerged as a more important priority. Kew wanted to see agricultural improvement too, but mainly in order to use the success in supporting economic botany as a lever to obtain more funds for its central, taxonomic, project. The Garden experimented with many crops but it ultimately became clear that more specialised input was needed. New agricultural departments took over most of the economic functions of the Garden at the beginning of the twentieth century, leaving it with a diminished role. An additional purpose, however, supported by the Government of Bengal, was to improve the

Garden so that it could provide a safe site for healthy and instructive leisure. King responded by devoting a lot of his time to securing and landscaping the Garden.

The other important issue in this period was the rise of Indian interest in western science, and the Garden's engagement with Indian practitioners, a key matter for its future as more Indians moved into administrative and professional roles. The chapter will also note the continuing improvement in communications, which allowed closer contacts and more effective cooperation within India, as well as a great expansion of the global botanical network. The Garden worked closely with Kew throughout, and the establishment of the Botanical Survey of India in 1890 helped in improving coordination between botanists.

Setting the agenda: the views of Kew and the Government of India

The periods of uncertainty about the future of the Garden in 1813-17 after Roxburgh left India, and in 1842-48, around the time of Wallich's departure, have been described in earlier chapters. The comparable period in 1869-73 has, however, attracted less attention from historians. The uncertainty then led to a series of interventions by those concerned about the Garden. The outcome was to give George King a clear view of what his priorities should be when he returned from sick leave in Britain and finally began his long-term management of the Garden at the end of 1873.

Thomas Anderson had rallied when he got back to Britain, and it seemed possible that he might be able to return to his post. In the interim, the Government of Bengal appointed Charles Baron Clarke, an inspector of schools who was also a very knowledgeable botanist, as Acting Superintendent in May 1869. Unfortunately Anderson died in October 1870. The Government then sought nominations for the post, and the rigidities of the Indian administrative system came into play. Fifty years earlier, Clarke might well have been offered the job, but now he was precluded, as he was an uncovenanted officer and he had no formal scientific qualification.¹ A

¹ Clarke did nevertheless become an important figure in nineteenth-century Indian botany. After 1871 he continued to work as a schools inspector. He had a variety of postings and spent all his leisure time examining and collecting plants. He was elected a Fellow of the Royal Society in 1882 and was seconded to Kew for five years to help Joseph Hooker to complete the *Flora of British India*.

number of Indian Medical Service (IMS) officers with botanical interests were at the end of their careers in 1871² so there were only two feasible candidates. George King, then a young IMS officer, had already written to Hooker, to say how eager he was for the post, and he was appointed, as his older rival, J. L. Stewart turned out not to be interested.³

King had arrived in India in 1865, and had spent a year as the acting superintendent of the smaller botanic garden at Saharanpur, which gave him some useful experience. He was delighted to be appointed to the Calcutta job, and fortunate to get such a prestigious post at the age of thirty-one. His strong relationship with Kew was founded on his gratitude to Hooker,⁴ and he was very aware that he needed to work closely with Kew. By the 1870s Kew had become the central coordinating point for British and imperial botany, and a powerful ‘centre of calculation.’ Botanists in India were close and willing collaborators, but they sometimes influenced Kew, which was, in its turn, a part of the ‘moving metropolis’ in Britain, altering the course of scientific progress in the empire, but in its turn being altered by those working on the periphery.⁵

Chapter Three made it clear that Joseph Hooker regarded ‘an accurate scientific guide to the flora’⁶ as the basis for economic, medicinal or any other botany. He had been relieved when Anderson did revive the Garden’s scientific capability, but worried that the Garden would cease to be effective after Anderson left. The early 1870s were difficult years for Joseph Hooker. He was engaged in a long and acrimonious struggle over Kew’s autonomy with Acton Smee Ayrton, the Commissioner for Works.⁷ At the same time, he had taken on the task of writing *The Flora of British India*, but his planned collaboration with his old friend, Thomas

² Hugh Cleghorn, the leading botanist in southern India, left Madras in 1869 after nearly thirty year’s service, and Nicol Dalzell left in 1870 after a similarly long spell in Bombay. William Jameson remained as Superintendent of the Garden at Saharanpur until 1876, but was never a contender for the Calcutta post.

³ RBG Kew DC 155: King to Joseph Hooker, 17th December 1870.

⁴ RBG Kew DC 155: King to Joseph Hooker, 24th April 1871.

⁵ Roy Macleod, ‘On Visiting the “Moving Metropolis”’: reflections on the architecture of imperial science’, *Historical Records of Australian Science*, 5, 3 (1982).

⁶ Hooker and Thomson, *Flora Indica*, Introductory Essay, 3.

⁷ Drayton, *Nature’s Government*, 212-19.

Thomson had finally broken down in 1870.⁸ He was therefore very anxious for support from India, and hoped that the Calcutta Garden would take the lead in coordinating the efforts of botanists in the different Indian presidencies.

When King sought his advice in 1871, Hooker, frustrated by the impact of the cyclones, had advised that the Garden should be moved. He wrote that the locality, soil and climate of the Botanic Garden were:

universally admitted to be eminently unsuited to the cultivation of any considerable collection of tropical plants. Putting aside the frequency of cyclones, the poverty of the soil, which is already exhausted and the utter sterility of the subsoil, it being percolated at all times by brackish water, is of itself a fatal objection...⁹

Such a view from Britain's most eminent botanist can hardly have been encouraging for an ambitious but inexperienced young IMS officer. For a short time before Anderson's departure in 1869 it had seemed that the Garden might be given a more convenient site. However, it was evident by 1871 that the government would not provide the extra funds needed, and Hooker eventually had to accept that. King came to terms with the situation quickly,¹⁰ and began to consider what could be done on the existing site. He was well aware that in Britain, Kew was under pressure to provide an attractive space for the public, whilst continuing its scientific work, on the grounds that it was the taxpayer who ultimately funded the whole establishment. At an early stage therefore, King decided to go ahead and landscape the Calcutta Garden;¹¹ his efforts will be considered in more detail in Chapter Six.

When he commented on the location of the Garden, Hooker had added that, '... the site is perhaps from want of drainage the most unhealthy in the neighbourhood.'¹² As if in confirmation, King himself became ill in August 1872 and had to return to Britain for over a year to recover. He was, however, able to spend some of that time at Kew and develop his relationship with Joseph Hooker. He returned to India in

⁸ RBG Kew Archives, Flora of British India, Folio 43: Joseph Hooker to Thomas Thomson, 30 July 1870.

⁹ RBG Kew Archives: undated letter (1871?) from Joseph Hooker to George King.

¹⁰ RBG Kew DC 156: King to Joseph Hooker, 15th July 1871.

¹¹ RBG Kew Miscellaneous Reports (hereafter MR) 226: Annual Report of the Royal Botanic Gardens, Calcutta for 1873-74, para. 2.

¹² RBG Kew Archives: undated letter (1871?) from Joseph Hooker to George King.

November 1873 fully briefed on *The Flora of British India* project and the support needed from India. To Hooker's great relief, King then remained in the post until 1898.

Kew's close involvement in Indian botany raised the question of whether the Calcutta Garden could continue its progress to becoming a 'centre of calculation' in its own right. If botanists in India were to confirm their own plant identifications, and produce scholarly work, then it was essential for them to have access to a large herbarium, drawings and a library. King was fortunate that Anderson and his curator, Sulpiz Kurz, had got the herbarium into good order.¹³ However, the herbarium collection remained modest compared to those in Europe. King decided to continue the process of improving it, and Kew was willing to collaborate, though still maintaining in 1880 that its own collection was the most comprehensive, and essential for serious work on Indian botany.¹⁴ Nevertheless, the level of collaboration between the two gardens was such that Calcutta was able to build up its collection to over a million specimens by 1900. The completion of *The Flora of British India* in 1897 and the growth of worldwide collaboration were important achievements, but there were also some dangers in Calcutta's closeness to Kew. As officials in India began to question the value of the taxonomic project, and sought more practical work from botanic gardens, Kew itself came to be seen as a somewhat out-dated institution that was failing to guide overseas gardens towards a greater focus on physiological work.¹⁵

The achievements during the last thirty years of the nineteenth century were partly the result of a major change of botanical personnel in India around 1870. By that time, there were botanic gardens at Saharanpur near Delhi, and at Bangalore and Ootacamund in the South. Dapuri, the only significant botanic garden in the Bombay Presidency, had closed in 1865. The leading botanists in Madras and Bombay, Hugh Cleghorn and Nicol Dalzell, had ended their days in the Forest Service, and there was not much serious botanical work done in either presidency after 1870. In North India John Duthie succeeded William Jameson as Superintendent at Saharanpur, in

¹³ Kurz had a significant publishing record, with some fifteen articles in the *Journal of the Asiatic Society of Bengal* in the 1860s and 1870s – see Bose, Pramatha Nath, Part III: 'Survey of Natural Science', in Mitra, Hoernle, and Bose, *Centenary Review of the Asiatic Society of Bengal*.

¹⁴ Thiselton Dyer, *The Botanical Enterprise of the Empire*, 11.

¹⁵ McCracken, *Gardens of Empire*, 209.

1876. Two others who were to be important late nineteenth-century botanists, James Sykes Gamble and George Watt, arrived in 1871 and 1873.¹⁶ King also got much specialist assistance from his friend David Cunningham (see Chapter One). This group of newly arrived scientists stayed in India until 1900 or later. They became used to working with each other over a thirty-year period, in a way that no previous group of botanists in India had been able to.

At this time, the wider institutional structure of India was being transformed. After the ending of East India Company rule in 1858 there had been a major effort to codify laws and reform the administrative and revenue systems. In the 1860s the Government assumed a higher profile and intervened more actively in various sectors. New Surveys were set up to cover areas such as archaeology, and the Public Works Department, originally founded in 1854, grew considerably. In Calcutta itself the port and railway systems were expanding to handle the growing exports of tea and jute that were replacing opium and indigo. Educational enrolments were continuing to rise, especially at the tertiary level, and a class of western-educated Indians was beginning to emerge.

All this affected the Botanic Garden's relations with the authorities. The imperial proclamation of 1858 set up five main provincial governments, each headed by a Lieutenant Governor. In the 1860s it had been decided that the Botanic Garden should report through the Government of Bengal, rather than direct to the Government of India. However, the period of uncertainty between 1869 and 1873 caused both of these governments to think more carefully about the Garden's role. That was part of a wider process as the governments sought greater efficiency in administration. Rivalry between the Imperial Government of India, its various departments and the provincial governments meant that powers had to be more precisely defined.¹⁷ As a result, rules, regulations and handbooks proliferated. The outcome was a large and increasingly stifling bureaucracy: accountability and routine procedures were clarified, but anyone who wanted to change systems or structures needed a wide range of contacts and much energy. Consequently, whilst the Botanic

¹⁶ Gamble became a Fellow of the Royal Society, and Watt was knighted.

¹⁷ Thompson and Garratt, *Rise and Fulfilment of British Rule*, 479.

Garden might benefit from the interest of a more activist government, it had to adjust to working within a less flexible bureaucratic system.

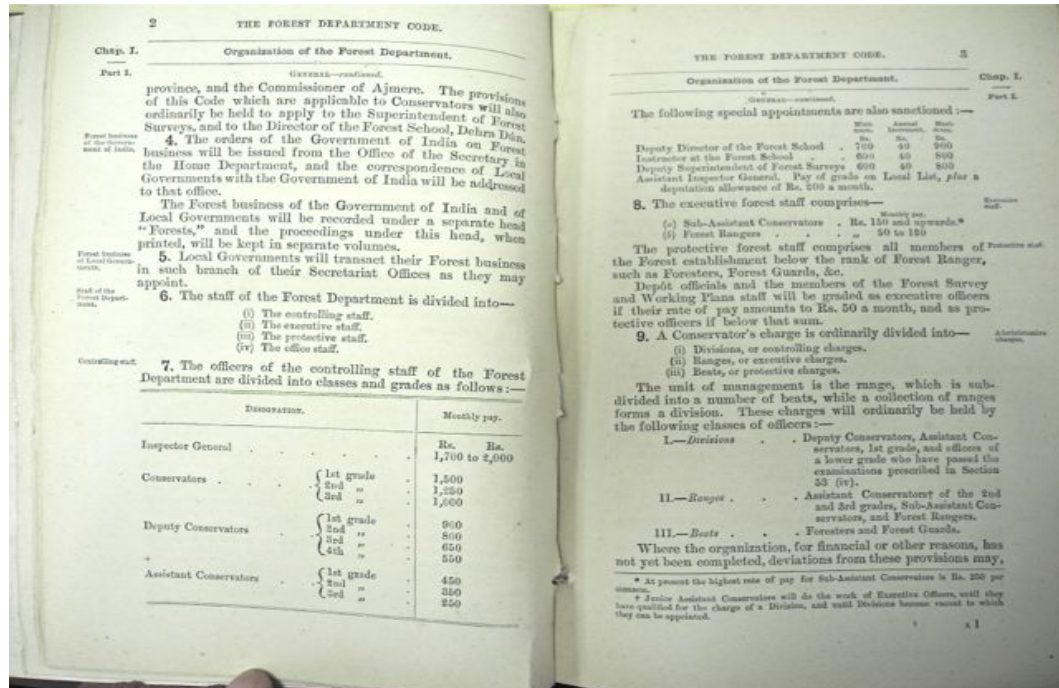


Figure 15. A rulebook for efficient administration: the Indian Forest Department Code of Instructions, 1886 (courtesy Central National Herbarium, Kolkata).

The early 1860s were a period of agrarian prosperity, which had helped the British to recover their assurance after the disasters of 1857-58.¹⁸ By the 1870s, however, that was changing: famines, and a sense that technological improvements were achieving less than expected, dented official self-confidence. The authorities hoped that the Botanic Garden would assist in meeting some of these challenges by helping to increase agricultural productivity. The lead came from the Lieutenant Governor of Bengal, but the Garden continued to be of interest to the Imperial Government, which was based in Calcutta for half the year.¹⁹ The Garden's position had in fact become somewhat anomalous. Both governments were aware of that. In July 1871,

¹⁸ Ibid., 481.

¹⁹ In the 'hot weather' each government moved to its hill station – Simla for the Imperial Government and Darjeeling for the Government of Bengal. So for half the year they were nearly a thousand miles from each other.

Allan Octavian Hume²⁰, the Secretary of the Imperial Revenue and Agriculture Department, wrote to the Government of Bengal, saying that:

The Governor General in Council concurs ... that the gardens are maintained more for imperial than local purposes. The garden is the oldest and most important in India, and its relations give rise to a good deal of correspondence with the Secretary of State and the Colonial and Foreign Governments. The appointment of the Superintendent moreover is made by the Secretary of State.²¹

The problem was that in spite of running the oldest, most important and best resourced botanical institution in colonial India, and having better access to senior officials, the Superintendent had no authority outside eastern India. It was therefore very difficult in the 1870s to organise a coordinated effort to obtain and publish botanical information about the whole country.

The Lieutenant Governor at the time, Sir George Campbell, was keen to develop Bengal's rural economy, and he tried to introduce botany as a subject at Presidency College.²² However, he was unimpressed at what had been happening in the Garden whilst Anderson was in charge. In his reply to A. O. Hume's letter on the question of whether control of the Garden should be transferred back to the Government of India, he wrote:

As regards the interests of Bengal, the Lieutenant Governor does not think that hitherto the province has been much benefitted by the Botanical Gardens, because practically they have not been sufficiently under the control of the local Government, and have been rather a scientific institution than an instrument for improving the vegetation of the province.

The late Superintendent turned out the (Agri-Horticultural) Society on the plea that he wanted the ground for scientific botany, and it has mostly been turned into what to the unscientific eye looks like a waste of bad jungle grass smothering a few ragged little trees scattered here and there, but the Lieutenant Governor believes is in reality a highly scientific plantation of trees according to their orders and species. The Lieutenant Governor would observe that as it is notorious that, on account of cyclones, trees are torn to pieces every few years, Calcutta seems a very bad place for a classified forest.

²⁰ Hume, like a number of his colleagues at that time, was a keen amateur naturalist. In retirement he not only helped to found the Indian National Congress in 1885, but also set up and endowed the South London Botanical Institute in 1910.

²¹ West Bengal State Archives, Proceedings, General Department, Section 46, October 1871: A. O. Hume to Government of Bengal, 31st July 1871.

²² Burkill, *Chapters on the History of Botany*, 147.

If they (the gardens) are to be kept up for purely scientific purpose, this Government has no desire to retain the supervision...At the same time the Lieutenant Governor would call to notice that his government is entirely without any agricultural or horticultural establishments of any kind, and his Honor (*sic*) has no means of making practical experiments for the improvement of the country...the Lieutenant Governor would like to be allowed to retain the gardens till at least he has some other means of trying to improve the useful plants of the country.²³

The clear views that Sir George Campbell expressed echoed those of the 1829 Finance Committee, and constituted a threat to the Garden. His heavy-handed sarcasm suggested little respect for what Anderson had achieved, and little enthusiasm for Bengal's revenues being used for purely scientific purposes. In spite of that, Sir George Campbell did not stop all scientific expenditure. The Government of India was also beginning to spend more on science in the 1870s. In Calcutta, it provided funds to construct a large new Imperial (later Indian) Museum²⁴ that covered science as well as art and archaeology. At the same time, the Government of India made an initial commitment to agricultural improvement, by setting up an agriculture department in 1871. However, it had too few resources to achieve much, and responsibility for agriculture reverted to the provinces in 1879.

Perhaps more helpful to the Botanic Garden, this was a time when there was much official interest in cataloguing and classifying India, and the government was committing significant resources to analysis and enumeration. W. W. Hunter proposed the first Imperial Gazetteer in 1869, and was appointed as Director-General of Statistics in order to prepare it during the 1870s. The government's change to 'a more systematic and self-consciously scientific regime of power'²⁵ was also reflected in the organisation of the first census in 1871-72. King therefore correctly assumed that he could use some of the Garden's budget to progress its taxonomic work, partly because information on botany was a constituent of the gazetteers.

²³ West Bengal State Archives: Government of Bengal, Proceedings, General Department, Section 49, Government of Bengal to Government of India Agriculture, Revenue and Commercial Department, 12th October 1871.

²⁴ The Museum was based on the collections of the Asiatic Society of Bengal and opened in 1878.

²⁵ Arnold, *Science, Technology and Medicine*, 130.

Sir Richard Temple took over from Campbell in 1874 and proved more sympathetic to George King's plans. He had spent the early part of that year supervising famine relief in Bihar. He was a man of great energy and a committed Christian, who believed firmly in Britain's duty to "improve" India. Temple was interested in botany and he commented in detail on King's Annual Report for 1873-74. He promised assistance with landscaping, but made it clear that economic botany was his priority:

With the organisation of a scientific department of forestry, the opening of an economic museum in Calcutta, the contemplated establishment of a central Government depot for the selection and interchange in the provinces, and the formation of a small department to superintend the experimental farms we are founding, His Honor wishes to see an end put to desultory and isolated efforts at advancement, and in place thereof, systematic sustained effort for developing the rich tropical soil of Bengal, without breach of continuity. Sir Richard Temple knows that he may count on Dr King's co-operation in these views, and is prepared to give all the assistance in his power to make the Botanic Garden, not a mere resort of the pleasure seeker, but a means of more actively stimulating the development of our natural possessions and advantages.²⁶

The message was not wasted on King, and for the next ten years or so he carefully highlighted "improvements effected during the year" in his annual reports.²⁷ He usually devoted more than half of the report to describing work on economic plants.

Still influenced by his experience in Bihar, Sir Richard Temple expanded on what needed to be done in a further statement:

... another object more immediately important seems to me to be this – to examine scientifically and botanically the physiological characteristics of all our principal indigenous staples, and the chemical properties of our soils, with a view to improving the fertility of our fields and the yield of our produce. Experiments in regards to these matters, in order to be at all conclusive, must be conducted and continuously watched by men of high scientific acquirements. With our limited resources this can be done only in a few selected areas. The lands belonging to the abolished Stud department at Pusa and a part of the large area belonging to the Botanic Gardens at Calcutta , are suitable for such a purpose²⁸

He finally summed up his priorities:

²⁶ RBG Kew MR 226: Resolution: Financial Department – Agriculture and Forests, Calcutta, 12th June 1874, attached to CBG Annual Report for 1873-74.

²⁷ RBG Kew MR 226: CBG Annual Reports, 1876-77 onwards.

²⁸ Quoted in C. E. Buckland *Bengal under the Lieutenant Governors* (Calcutta 1910), 616.

...the Botanic Garden should be and might be made, not only a place of economic value and scientific importance, but also an ornament to the suburbs of Calcutta.²⁹

That was not the end of Temple's interest. He also wrote a five-page memorandum to set out future policy in developing the Herbarium.³⁰ He started by explaining the need for a herbarium and gave much detail about plant families, so the memorandum was very likely based partly on a draft by King, who was by then becoming adept at getting what he wanted from officials. In his closing paragraphs Temple focussed on a number of issues that would be important for the future. He directed King personally to collect all over India,³¹ although King never really did so. King did not have the time, and it was only after the foundation of the Botanical Survey in 1890 that collecting throughout India began to be coordinated. Temple also expressed his hope that the number of students of botany, 'both European and native', who would wish to use the herbarium would constantly increase.³² He thus anticipated an Indian pursuit of scientific botany that did not occur for another twenty years, partly because of an apparent lack of encouragement from King and his fellow European botanists.

At the end of his memorandum Temple pointed out that he had only discussed systematic botany, and not 'the other parts of the science – morphological and physiological -'.³³ In the 1870s the science was changing. German botanists had already done much to advance understanding of the structure of plants and how they functioned. Kew realised that this was the key to the understanding of plant growth and hence the ability of botanic institutions to provide practical advice on improving crops. Kew's Jodrell Laboratory was set up at this time. However, even though the new Assistant Director at Kew, William Thiselton Dyer, was a physiological botanist, taxonomic research remained Kew's priority.³⁴ Calcutta Botanic Garden took a long time to develop any similar capability in plant physiology, as King did not follow up Temple's comment and bid for funding for physiological work. The Garden

²⁹ *ibid.*, 618.

³⁰ RBG Kew MR 105: Temple's minute of 9th September 1876.

³¹ *Ibid.*, 5.

³² *Ibid.*, 2.

³³ *Ibid.*, 5.

³⁴ Drayton, *Nature's Government*, 244.

therefore had little to offer in the 1890s when the Government became increasingly concerned to increase agricultural productivity and research plant disease.

Temple's intervention was very important. He wrote in far more detail than any previous official had. He clearly thought that the state of the Garden was unsatisfactory but was much more positive about the scope for improvement than Campbell had been, and he set out an imaginative programme for the future. King thus had a clear steer to concentrate his work on the introduction and improvement of economic crops, with the scientific investigation of India's flora taking second place and landscaping being a possibility too. Temple did in fact provide special grants for garden improvements and a good deal of landscaping was done, as will be outlined in Chapter Six.

Even when he was still relatively young and junior, King had demonstrated his ability to maintain good relations with senior officers in the Indian Civil Service. He benefitted from his closeness to Calcutta, the capital of both India and Bengal, and his willingness to take on additional work. Even so, in the new hierarchical imperial environment he was lucky to win the attention of the Lieutenant Governors, and could not hope for much interest from the Viceroy, who spent a lot of his time in distant Simla. The days when Wallich had regular contact with Lord Auckland, and attended his scientific soirées, were long since gone.

King proved himself adept at coping with the different pressures from Kew and the Government of Bengal. We should be careful, in any case, not to make too much of any apparent conflict between taxonomic and economic botany. King was given extra resources for taxonomic work partly because many officials were still influenced by the mid-Victorian enthusiasm for natural history. Almost all cities, including many in Asia, had a botanic garden. They were regarded as a sign of civilisation, and it would have been difficult for officials in the 1870s or 1880s to close the Calcutta Garden, or cut its budget, even if they had wanted to.³⁵

³⁵ McCracken, *Gardens of Empire*, 166.

King's first two decades, 1871-90

King did his best to carry out the sort of economic work that the Lieutenant Governors wanted, and he tried doggedly to introduce new species. His early efforts focussed on ipecacuanha, a medicinal plant thought to be effective in treating dysentery, and on rubber, but neither adapted well to the climate of Bengal. He was more successful with trees, but by the late 1880s the Government accepted that there was little point in further experimentation. King may not have succeeded in making significant crop introductions, but he was able to impress the Lieutenant Governors with his work on the cinchona plantations. He needed to ensure that febrifuges (fever suppressants) could be produced on an economic scale, and by 1875 a factory had been established at the plantation at Mungpoo. He secured the continuing viability of the enterprise by introducing a more economic method of separating quinine in 1887.³⁶ King's success in producing a cost effective febrifuge was an important element in maintaining his own scientific standing, as well as the Garden's reputation for doing economically useful work. These aspects of the Garden's work are covered in more detail in Chapter Five.

King still felt overshadowed by his predecessors during his first decade. In his report for 1875-76 he looked forward to improvements, saying: '...there is no reason why this garden should not become as good as ever it was in the past, and regain its old reputation of containing a really fine collection.'³⁷ By that time he had begun to re-landscape the Garden with the funds provided by Sir Richard Temple, and his work was endorsed when the rather inconveniently sited Botanic Garden was included in the programme for the visit by the Prince of Wales.³⁸ In the following years the extra funds enabled King to put up a number of important new buildings, including a new herbarium in 1883. That meant that the Garden had more to offer, and by the early 1880s, King felt that some of his landscaping objectives had been achieved. His first words in the Report for 1882-83 are: 'The past year has seen the completion of most of the improvements in the garden grounds which were sketched out by me for the approval and sanction of Government in the year 1874.'³⁹

³⁶ Burkill, *Chapters on the History of Botany*, 172.

³⁷ RBG Kew MR 226: Calcutta Botanic Garden Annual Report for 1875-76, para. 4.

³⁸ Sir Joseph Fayrer, *Recollections of My Life*, (London, 1890), 359.

³⁹ RBG Kew MR 226: Calcutta Botanic Garden Annual Report for 1882-83, para. 1.

Even though he prioritised economic botany in his reports, King did not neglect the taxonomic project. He continued to arrange for seeds and plants to be collected in India, and the herbarium collection steadily expanded.⁴⁰ By carefully fostering relations with officials in remote places he was able to obtain plants and seeds from areas that were less well known botanically, such as Assam, Burma, the Andaman Islands, and parts of Southeast Asia. Between 1878 and 1890 the number of cabinets in the herbarium more than doubled from 75 to 186.⁴¹ Calcutta started to play a more prominent role in the global exchange of specimens and plants too. In the 1870s an average of 16,080 plants was despatched each year.⁴² In the 1880s that increased to 37,573 and the garden and herbarium stock were greatly augmented by the plants and specimens received in return.

The herbarium also contained the Garden's library. A notable addition at this time was the collection of twenty-nine bound volumes of letters received by Wallich whilst he was in India.⁴³ Wallich had taken them back to Britain in 1846 and they had passed to Kew when he died.⁴⁴ The fact that Kew was willing to send the whole of this valuable collection back to Calcutta was a real endorsement of King's work. In return, King did his best to make sure that Hooker received support from India in writing *The Flora of British India*. Although Hooker was the lead author, the seven volumes were in fact a joint effort. Charles Baron Clarke was given special leave by the Government of India to work with Hooker at Kew. John Duthie, the superintendent at Saharanpur, and King himself, both had a significant input as well.⁴⁵

King's growing confidence led him to make the case in his 1875-76 Report for expanding the plant collection to include, 'the flora of the higher and colder parts of the Indian Empire.'⁴⁶ He argued that: 'To be complete the botanical garden of an empire should contain representatives, if not of every species, at least of every genus

⁴⁰ Desmond, *European Discovery*, 102.

⁴¹ West Bengal State Archives, File M I-C/4 para. 22: King to Government of Bengal 10th July 1890.

⁴² Based on statistics in the Annual Reports on the Garden.

⁴³ The letters have proved a very valuable resource for this thesis.

⁴⁴ RBG Kew MR 226: Calcutta Botanic Garden Annual Report for 1887-88, para. 4.

⁴⁵ Burkill, *Chapters on the History of Botany*, 147.

⁴⁶ *Ibid.*

indigenous within the limits of that empire.⁴⁷ In talking in this way about ‘the botanical garden of an empire’ King was making assumptions about official support for natural history. Such striving for comprehensiveness was a characteristic of botanic gardens in the later nineteenth century:

Like islands, the new botanic gardens, intended to collect together representative specimens from every part of the world, themselves acquired a meaning as symbols of an economic power capable of reaching and affecting the whole biological world.⁴⁸

Temple replied that Bengal did not have the financial resources to, ‘supply this defect by establishing branch gardens in the lower Himalayas,’ but promised to keep the matter under consideration. Consequently when, ‘a beautiful piece of land within the station, in an accessible situation and with an excellent aspect’⁴⁹ was generously offered in Darjeeling in 1878 by Mr William Lloyd, ‘an old and well-known resident of the place’ King seized the opportunity. The new garden was named after Lloyd, and still bears his name.⁵⁰ The Darjeeling garden was always a shoestring affair, run by a gardener rather than a botanist. Even though the budget was less than Rs.10,000 a year, it showed the continuing commitment of the Government of Bengal to the botanical project, and provided a very useful facility for growing the more temperate plants that would not flourish in Calcutta.

King’s other major project in this period was to negotiate a structure to coordinate botanical work, which finally resulted in the emergence of the Botanical Survey. There had been proposals to do this since the ending of East India Company rule in 1858. As noted earlier, Sir Richard Temple in 1876 had suggested that King collect all over India. But action was finally stimulated by Kew, following an address to the Colonial Institute in London in 1880 by William Thisleton Dyer, Joseph Hooker’s deputy, in which he surveyed all the botanical resources of the Empire, and suggested that:

Calcutta Botanic Garden, which should be the headquarters of botany in India, has somewhat lost ground in becoming little more than the botanical department

⁴⁷ RBG Kew MR 226: Calcutta Botanic Garden Annual Report for 1875-76, para. 4.

⁴⁸ Grove, Richard, Damodaran, Vinita and Sangwan, Satpal (eds.), *Nature and the Orient* (Delhi, 1998), 189.

⁴⁹ RBG Kew MR 226: CBG Annual Report for 1878-79 para. 13

⁵⁰ Ibid.

of the Bengal Presidency, and the superintendent is pretty well overwhelmed with purely local duties....

The capital of India should be the seat, however, of a botanical intelligence department, where an officer possessed of business capacity and scientific qualifications, and with proper assistants, should study the botanical capacities and needs of the different parts of that empire, and lay down a policy by which they might be developed and supplied.

He added that, '(Ceylon) is a place of peculiar interest, and ought indeed to be regarded as the Kew of the East.'⁵¹ Dyer was expressing Kew's frustration, already noted, at the lack of coordination of the botanical effort in India, where there were probably more botanists than in any other part of the Empire. But it was his last sentence that is most likely to have needled India's rulers. Ceylon was tiny compared to India, but it seemed to have focussed its botanical efforts much better.

The network to be coordinated was not very large. Apart from Calcutta and Darjeeling, there was the Saharanpur Garden, whose superintendent, Duthie, was responsible for northern India. In South India there was the small botanic garden in Ootacamund but the Superintendent, M. A. Lawson, was mainly concerned with the cinchona plantations nearby. In the Bombay Presidency, there was still no botanic garden, but Dr T. Cooke, Principal of the College of Science in Poona, did some botanical work. As already noted, there were a few other European botanists outside this modest network: George Watt and David Cunningham at the University of Calcutta, James Sykes Gamble in the Forest Department and Charles Baron Clarke in the Bengal Education Department. All of these men did a lot of collecting and were important contributors to the herbarium in Calcutta.

However, change was not easy: it required a great deal of energy, and nearly ten years of effort, to produce the modest Botanical Survey structure that finally emerged. Large numbers of people were involved and all had to be consulted – the directors at Kew (via the India Office in London), the Revenue and Agriculture Department of the Government of India, the finance authorities in India and the provincial governments with their various departments. A few years later Lord Curzon described the process, albeit on a weightier matter:

⁵¹ Thiselton Dyer, *The Botanical Enterprise of the Empire*.

Round and round, like the diurnal revolution of the earth, went the file, stately, solemn, sure and slow; and now, in due season, it has completed its orbit, and I am invited to register the concluding stage.⁵²

Another viewpoint came from Charles Baron Clarke:

The financial secretaries of India, Allahabad &c. treat these little scientific questions (that they care nothing about) merely as a little game for throwing petty charges from the provincial to the imperial budget – and vice versa.⁵³

An important figure in keeping the process moving was Lieutenant General Sir Richard Strachey. Strachey was born in 1817, the same year as Joseph Hooker. He was a good example of a mid-Victorian official with an enthusiasm for natural history. As a result of their common interests in botany and the investigation of the Himalaya, Strachey and Joseph Hooker had become good friends.⁵⁴ Strachey served on the Council of India, the advisory body to the Secretary of State in London, from 1875 to 1889, and provided informal advice to both King and Hooker in their dealings with the Indian administration. Strachey had no illusions about the difficulty of pushing forward the Botanical Survey proposals. Writing to Joseph Hooker in 1884 to suggest a meeting to discuss the issue, he said:

Whether anything is likely to be done here in such a business is more than I can say. We are not very muscular, or intellectual for that matter, at the I. O. (*India Office*) at present. The art of doing nothing & giving in is that most practised! But we can try. –⁵⁵

A month later Edward Buck, the Government of India Secretary for Revenue and Agriculture, described his struggle to get short-term funds for Watt to do work on economic botany, and was equally unflattering about the ways of the Indian bureaucracy:

But all this is very unsatisfactory – there is nothing in it of a self working character – I happen to take an interest in these things & give them a push but the next man will have other interests and let them slide. But as, with all my zeal, I find the Finance Dept. obdurate, notwithstanding that I point out the false economy of the multiple expenditure in the provinces, it is not likely that any pressure will at

⁵² Curzon on the proposal to form a new province of Eastern Bengal, quoted in Thompson and Garratt, *Rise and Fulfilment of British Rule*, 574.

⁵³ RBG Kew MR 107: Note 51 by C B Clarke, 29th March 1890.

⁵⁴ Obituary in *The Spectator*, 22nd February 1908, 13.

⁵⁵ RBG Kew MR 107: Strachey to Joseph Hooker, 5 June 1884

any future point be put on the RA (*Revenue and Agriculture*) Dept. to perform what I think is a natural duty – the only pressure that can come is from home, and if it comes I will of course respond.⁵⁶

Buck proposed a scientific service in which the work of all the scientists in India would come under central control. King was suspicious of this and worked to maintain the independence of the botanists.⁵⁷ Gradually the idea emerged of creating an all-India Botanical Survey whilst retaining the provincial funding. The creation of Surveys had a long history. Britain had had its Ordnance Survey since the end of the eighteenth century, and more recently a Geological Survey. The Imperial Government, with its history of wanting to examine and catalogue India, had used the device more freely. By the 1880s there was a Survey of India (for mapmaking), an Archaeological Survey and a Geological Survey. The Botanical Survey was soon followed by a Zoological and a Linguistic Survey. As Macleod has pointed out, militarised imperial rule led to a belief in centralised direction of scientific exploration and research.⁵⁸

The long debate that preceded the emergence of the Botanical Survey had the disadvantage for King that it encouraged officials to reflect on how far the Government was benefitting from its support of botany. In the minuting in 1887 there was concern about the high level of King's salary, and it proved difficult to get Madras and Bombay to commit even the modest amounts of money needed for them to participate in the Survey proposals.⁵⁹ There was a sting in the tail of Buck's letter to Thiselton Dyer (by then Director at Kew) about the mechanics of the appointments:

All appointments to be made by the India Office on the nomination of Kew. Appointment to Calcutta to be confirmed by Kew or at any rate Kew to be consulted in the appointment. I do not think a native of India should be appointed until he has gone through a course at Kew & is approved & nominated by Kew.⁶⁰

⁵⁶ RBG Kew MR 107: E. C. Buck to J. F. Duthie, 20 July 1884.

⁵⁷ RBG Kew DC 156: King to Sir Joseph Hooker, 25th February 1890.

⁵⁸ Roy MacLeod, 'Scientific Advice for British India: Imperial Perception and Administrative Goals, 1898-1923', *Modern Asian Studies*, 9, 3 (1975), 343-384.

⁵⁹ RBG Kew MR 107: no. 26 E. C. Buck to Thiselton Dyer, 3rd June 1887.

⁶⁰ RBG Kew MR 107: Confidential letter from E. C. Buck to Thiselton Dyer, 15 March 1887.

My only doubt is whether India wants so many Botanical officers & whether the Howrah (*i.e. Calcutta*) officer and the Saharanpur officer could not divide India between them.⁶¹

At the end of 1889 the Viceroy's Council also queried the need for so many botanical posts:

The scheme for a botanical survey, as it now stands, provides for botanical explorations over the whole area of our Indian possessions and is so far satisfactory. But we are inclined to believe that it will not be necessary to maintain permanently so large an organization for botanical research, to which branch of scientific enquiry more expenditure and time have been devoted than to many equally important subjects, and that it will be desirable to re-examine the question when any of the appointments now held by botanical experts become vacant.⁶²

The new scheme was finally agreed in 1890. The botanists did in fact suffer one setback during these prolonged negotiations. In 1889 Duthie, the Superintendent at Saharanpur, was transferred to the Imperial Service to act as Government Botanist for the whole of Northern India. Without his day-to-day supervision the Saharanpur garden and herbarium gradually declined. More seriously, it was decided that when Duthie retired his post would cease to exist.⁶³ On the positive side, a part-time Government Botanist post was created in the Bombay Presidency, modest funds for exploration were provided, and King was given the authority to guide and advise his fellow botanists. In practice most of King's energies continued to be focussed on Bengal (including Orissa and Bihar), Assam and Burma.⁶⁴

Whilst the Botanical Survey was being set up King was also developing the Garden's publishing. The growing collection, the new herbarium, and the increasingly well-stocked library enabled botanists in India to study specimens much more easily. Some results appeared in the *Journal of the Asiatic Society of Bengal*, but in 1887 the first volume of the Garden's own specialist publication, *The Annals of the Royal Botanic Garden, Calcutta*, came out. King founded this series to supplement Hooker's *Flora of British India*, and to allow the publication of longer specialist botanical monographs. Most of the illustrations were by the Garden's own artists and they were lithographed

⁶¹ RBG Kew MR 107: no. 26 E. C. Buck to Thiselton Dyer, 3rd June 1887.

⁶² RBG Kew MR 107: Government of India Revenue and Agricultural Department No. 9 of 1889 to the Secretary of State for India, 24th December 1889.

⁶³ RBG Kew MR 107: Note by C. B. Clarke, 29th March 1890.

⁶⁴ RBG Kew MR 107: D. Prain to A. T. Gage, 8th May 1907.

at the recently established Government School of Art.⁶⁵ This was another way in which Calcutta was becoming a ‘centre of calculation’ in its own right, and it was an achievement of Indian as well as European specialists.

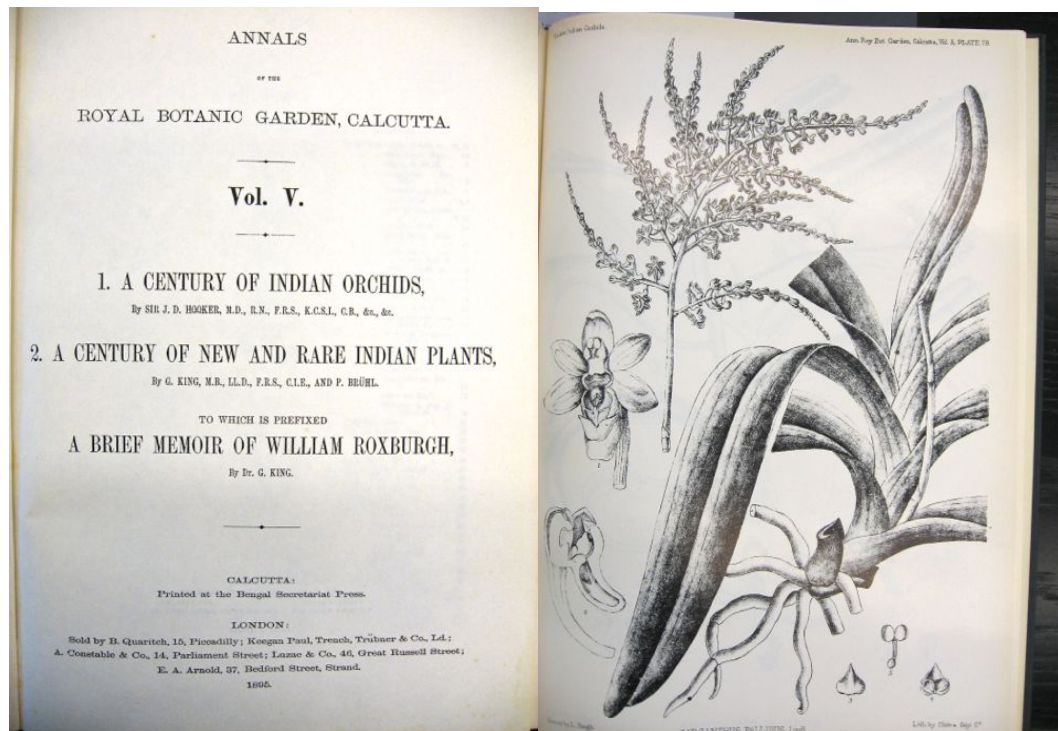


Fig. 16. A page from the *Annals*, illustrated by Lakshman Singh⁶⁶ (reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew)

The Annals contributed much to the scientific reputation of the Garden. Joseph Hooker later wrote: ‘*The Annals of Calcutta Garden* are magnificent; they are an imperishable record of the energy of King in starting the series.’⁶⁷ But the main focus was on taxonomic questions. Early volumes of *The Annals* contained lengthy papers by King and Prain on the species of *Ficus*, *Pedicularis*, *Quercus*, *Castanopsis*, and *Myristica*. Only King’s friend, Dr David Cunningham, Professor of Physiology at the Medical College, wrote on the physiology of plants, an amateur interest of his.⁶⁸

⁶⁵ Desmond, *European Discovery*, 152.

⁶⁶ Alternative spellings are Lutchman Singh or Lachhman Singh.

⁶⁷ Hooker to Gage, 17th April 1909, quoted in Huxley, *Life and Letters of Sir J. D. Hooker*, 398.

⁶⁸ See *Annals of the Royal Botanic Garden, Calcutta*, Vol. 1, Supplement (1888) and Vol. 6, Part 1 (1895).

King's publishing programme was not restricted to *The Annals*. He later initiated a series *The Records of the Botanical Survey of India*.

When King left in 1898 Prain continued the *Annals* publishing programme, and in 1903 he published his 1,000-page flora *Bengal Plants*. That finally supplanted the partial works from the first half of the nineteenth century, and provided an authoritative account of the provincial flora. Prain wrote many articles for the *Journal of the Asiatic Society* and other local journals as well.⁶⁹ Nearly all of these publications were specialist works, mainly of interest to professional botanists.⁷⁰ The Botanic Garden did not attempt to publish popular accounts of the Indian flora, but by the 1860s and 1870s a number were appearing.⁷¹ They helped gradually to build interest in botany amongst educated Indians.

King had good support in his early years from his herbarium and garden curators, Sulpiz Kurz and John Scott. However, he had to deal with a drawn out staffing crisis in the 1880s. It started in 1878 when Kurz died. King filled the vacancy by appointing John Scott to the herbarium curator post, and promoting Adolph Biermann, the assistant garden curator, to succeed Scott. However, when inspecting the Garden one day in 1879 Scott and Biermann were attacked by an escaped tigress.⁷² Scott rescued Biermann, but Biermann died in 1880. Scott died (from unrelated causes) in the same year. King then started the slow process of getting Government of India authority to recruit a new herbarium curator. The Secretary of State for India consulted Joseph Hooker at Kew, but the first four of Hooker's nominees were unwilling to take on the job. The outcome was that Hooker put forward the name of L. J. K. Brace, Dispenser of Medicines in the New Providence Asylum in the Bahamas, who had been recommended to Hooker by the former Governor.⁷³ Brace arrived in Calcutta in 1881 and worked reasonably effectively at

⁶⁹ See Royal Society Archives: I. H. Burkill's Obituary of David Prain, 1944.

⁷⁰ The descriptions in *The Flora of British India* were a little more accessible to the non-experts as they were in English, unlike Hooker and Thomson's fragmentary *Flora Indica* of 1855, which used Latin.

⁷¹ Heber Drury, *Handbook of the Indian flora* (Travancore, 1864); Daniel Oliver, *First Book of Indian Botany* (London, 1869); William Roxburgh, *Flora Indica* (republished by C. B. Clarke, Calcutta, 1874); George Watt, *First Steps in Botany* (Calcutta, 1877). The first textbook in Bengali, by Jadunath Mukherjee, was published in 1869, and Watt's book was translated into Bengali in 1877 (see Desmond, *European Discovery*, 189).

⁷² The tigress had escaped from the menagerie of the former King of Awadh across the river – see Rosie Llewellyn-Jones, *The Last King in India: Wajid Ali Shah* (London, 2014).

⁷³ RBG Kew DC 155: Thiselton Dyer to Louis Mallet, India Office, 15th October 1880.

first. However, he suffered a breakdown in 1885-86 and had to return to Britain. King dealt humanely with the case, but it was a real diversion of his energies.

Brace was not the only staff member who caused difficulties for King at this time. In 1883 the acting garden curator, J. Craig, had to be dismissed for misconduct. A few years later, an assistant garden curator called Halvey, and then the garden curator, McHardy, also suffered breakdowns. King's reflections on the situation provide an interesting insight into social relations at the Garden:

Mr McHardy's breakdown is very sad. There is no doubt the life of a gardener here is very lonely & there is always a temptation to drink. I do what I can to brighten the lives of the Curator and Assistant Curator & so does Prain. We have them to dine pretty often. And I subscribe to 6 London weekly newspapers which I lend them. I also lend them books freely...⁷⁴

Halvey and McHardy's successors did settle better, and stability in the garden curator post was restored with the appointments of Robert Proudlock (1891-96) and G. T. Lane (1896-1923). There was a remarkable contrast between these well-trained, capable and respectable men and the 'unemployed Europeans' who Griffith said were picked up in the 1830s and 1840s as garden curators.⁷⁵

In the end, Brace's departure strengthened the Garden. When King was on leave in 1884 he encouraged promising young Scottish medical students with an interest in botany to enter the Indian Medical Service. David Prain responded, and went to India in 1885. King was soon able to divert him from his regiment, and recruited him as a replacement for Brace in 1886. Prain turned out to be as able and hard working as his Superintendent and the two men became close friends. He was also more familiar with physiological botany, though, like King, his real interest was in taxonomy. Between 1886 and 1898 the Garden had its strongest-ever scientific team, partly thanks to King's very vigorous lobbying for a higher salary than the Rs. 450 per month that Prain received initially.⁷⁶

⁷⁴ RBG Kew DC 156: King to Joseph Hooker, November 1890.

⁷⁵ Proudlock ended his career as arboricultural adviser to the Government of Bengal, and later became president of the Kew Guild. Lane became a leading freemason in Calcutta, an honorary magistrate and a volunteer officer in the Naval Defence Force (see *Kew Guild*, 1936).

⁷⁶ West Bengal State Archives, File M I-C/4 para. 22: King to Government of Bengal, 10th July 1890.

When King retired in 1898, Prain was his natural successor. This precedent, of using the Herbarium Curator post as a preparation for becoming Superintendent, meant that all the succeeding British superintendents already had a good deal of experience – Gage spent six years as herbarium curator before he succeeded Prain, and Calder had worked for twelve years at the Garden by the time that he took over from Gage in 1925.

One of the continuing issues throughout this period was the extent to which local people were to be involved in the botanical enterprise. When King wrote about the botanical account of India, he did so as if it was largely the concern of Europeans. He was no more enthusiastic about teaching at the Medical College than his predecessors. In his Annual Report for 1875-76 he said that, ‘my labours as Professor of Botany at the Medical College’ were one of the reasons he has ‘even less time than usual’ for scientific work.⁷⁷ As a result Sir Richard Temple asked the University to reduce the number of lectures from forty to twenty per year.⁷⁸ The University agreed, and King then continued to lecture until 1895, when Prain took over.⁷⁹

Temple had also pointed out that interest in science was spreading amongst the Indian professional classes.⁸⁰ King did not ignore the emerging Indian intelligentsia entirely: in 1876 he reported that, ‘I have also edited the botanical portion of a book on Sanskrit Materia Medica which has been prepared by Baboo Ooday Chand Dutt, lately Civil Surgeon of Noakholly.’⁸¹ Dutt was grateful for King’s input and wrote in his preface:

To Dr. George King I feel myself particularly beholden. He has helped me most materially On many occasions he has spent hours identifying various drugs for me; and he has revised nearly all the last proofs, before the sheets were printed.⁸²

⁷⁷ RBG Kew MR 226: CBG Annual Report for 1875-76 para. 14.

⁷⁸ RBG Kew Archives: Temple’s minute of 11th October 1876.

⁷⁹ RBG Kew MR 227: CBG Annual Report for 1895-96 para. 9.

⁸⁰ RBG Kew Archives: Temple’s minute of 9th September 1876.

⁸¹ RBG Kew MR 226: Calcutta Botanic Garden Annual Report for 1875-76 para. 14.

⁸² Uday Chand Dutt, *The Materia Medica of the Hindus* (Calcutta, 1877).

Dutt went on to acknowledge the help of others at the Botanic Garden – the knowledgeable overseer, Prasanna Kumar Sen, as well as Sulpiz Kurz. King seems to have been happy to work with Dutt, who was a capable and respected figure: George Watt also relied on him for information.⁸³ Twenty years later King and Watt helped K. L. Dey to produce *The Indigenous Drugs of India*. However, these were responsive gestures, and there is no record of King taking the initiative to follow up on Temple's hint that he should encourage the 'natives' to take an interest in the contents of the herbarium.

1890-1914: the reassessment of the Garden's role

The early 1890s can be seen as something of a turning point for Calcutta Botanic Garden. For a while, the setting up of the Botanical Survey breathed some new life into the taxonomic project, but the messages from the Government became increasingly blunt. This was a time when British rule began to face a stronger challenge. Neither of the viceroys in the 1890s, Lords Lansdowne and Elgin, was a reformer.⁸⁴ Consequently larger and larger numbers of educated Indians began to ask what the future held for them. Their questioning, in Congress and elsewhere, began to gain them the initiative against the increasingly defensive British officials who controlled policy, but lacked ideas. The Garden's failure to establish links with the scientists within this rising generation, meant that in the long term its role was likely to diminish.

Lord Curzon, who succeeded Elgin in 1899, was initially admired by some Indians for his dynamism and reforming spirit, but in the end they despaired at his patronising attitudes and insensitivity.⁸⁵ They began to adopt increasingly bold methods to make their case. A small number turned to terrorism, and had an impact out of proportion to their numbers; many more Indians supported swadeshi action, and refused to buy British goods.⁸⁶ The new sense of unease was vividly expressed by Prain's successor, Andrew Gage, who wrote in 1909:

⁸³ Watt mentions their collaboration in his introduction to the *Dictionary of Economic Products*.

⁸⁴ Gopal, *British Policy In India*, 180.

⁸⁵ Ibid., 223-4.

⁸⁶ Thompson and Garratt, *Rise and Fulfilment of British Rule*, 548.

The condition of India generally and of Bengal in particular is far from reassuring. All sorts of rumours are in the air and suspicion everywhere. There has been trouble in the 10th Jats at Alipore, and the West Kents have been brought down from Darjeeling, ostensibly for “winter training”.... It is now freely said in Calcutta that the Viceroy’s bodyguard has been tampered with. It is significant that one of the men arrested in connection with the murder at the High Court a few days ago is the shorthand typist of Wheeler, the Bengal Finance Secretary. The Magistrate of Howrah is constantly shadowed by police as he is considered by no means safe from attack. Sir Edward Buller looks very careworn and ill and no wonder, for he never can be sure whether a bomb or a bullet is being directed at him. To this pass has weak Government brought us, and the efforts of radical gentry at home.⁸⁷

However this air of confrontation was never the whole story. By the 1900s many of the substantial Indian middle class spoke English, and some had trained in Britain. They were more comfortable in European society than their predecessors had been, and quite a few of the British wanted more social contact. The universities, the medical societies, the courts and the Asiatic Society itself were becoming places where thinking members of both races met and exchanged views. In 1907 the Calcutta Club was founded as a location for Indian and British people who wanted to socialise and enjoy sports together, in reaction to the racist policies of the Bengal Club.⁸⁸ It was an instant success. In the science field as elsewhere, often clumsily and painfully, the British and Indians did begin to work together, and move towards the ultimate transfer of responsibility.

At the same time the pace of technological change accelerated. For the more conservative, whether British or Indian, that added to the sense of unease, but for others it was stimulating. New technologies began to affect the way people lived and communicated. Visitors to the Botanic Garden were arriving on bicycles by the middle of the 1890s and in cars ten years later.⁸⁹ By the Edwardian era electricity and telephones were normal features of offices, and cinemas, experimental radio transmissions,⁹⁰ and the first air service⁹¹ had all reached India before 1914. These exciting new technologies that captured people’s imaginations in the late nineteenth and early twentieth centuries were nearly all based on engineering. They could

⁸⁷ RBG Kew DC 158: Gage to Prain, November? 1909.

⁸⁸ <http://www.calcuttaclub.in/theclub>, accessed on 15th January 2015.

⁸⁹ RBG Kew MR 227 Calcutta Botanic Garden Annual Report for 1896-97, 1, and for 1906-07, 1.

⁹⁰ http://en.wikipedia.org/wiki/Telecommunications_in_India, accessed on 5th April 2015.

⁹¹ http://mospi.nic.in/Mospi_New/upload/statistical_year_book_2011 accessed on 5th April 2015.

improve comfort and communications, but did not help India's British rulers to address some of their more fundamental challenges. Millions died in famines in the 1890s, and thousands fell victim to outbreaks of plague that were handled ineptly by the authorities. As Peter Marshall has written:

Late nineteenth-century India was ground on which the irrigation engineers, the Indian Medical Service, the sanitation authorities and the conservators of forests did battle with dearth, disease and drought, and were not winning.⁹²

This had an obvious bearing on government attitudes to science. In contrast to what was being achieved in engineering, the biological sciences seemed able to do little towards improving agricultural productivity and combatting infectious diseases.⁹³ There were some achievements: Ronald Ross, who was based in Calcutta, did manage to explain the transmission of malaria in 1898. Ross's success was based on careful microscopy. Biology's future lay in understanding tissues and organisms on a smaller and smaller scale. This was the age when bacteria and the processes of infection were beginning to be unravelled, and the functions of the cell were being investigated.

Lord Curzon was very concerned about the Government's failure to cope with the major famines in 1898 and 1900.⁹⁴ This caused him to re-examine the role of science, and he set up a Board of Scientific Advice (BSA) in 1902.⁹⁵ The BSA represented two shifts in the Government of India's attitude – firstly, a belief that science in India could be cultivated without supervision from London, and secondly, that the former preference for the natural history sciences must be replaced by public sponsorship of industrial technology, based on chemistry and engineering.⁹⁶ At this time, it was becoming clear that serious agricultural research needed complex and large-scale inputs that were beyond the capacity of botanic gardens. There was therefore a

⁹² Peter Marshall: History in Focus Review Article of David Cannadine, *Ornamentalism: How the British Saw Their Empire* (London, 2001), <http://www.history.ac.uk/ihr/Focus/Empire/reviews/marshall2.html>, accessed on 7 July 2012.

⁹³ Kumar, *Science and the Raj*, 106.

⁹⁴ Arnold, *Science, Technology and Medicine*, 151.

⁹⁵ Kumar, *Science and the Raj*, 105-6.

⁹⁶ Deepak Kumar, 'Reconstructing India: Disunity in the Science and Technology for Development Discourse, 1900-1947', in Macleod, Roy, *Nature and Empire: Science and the Colonial Enterprise*, *Osiris*, 2nd series, 15 (Chicago 2000), 243.

worldwide trend for them to withdraw from work on economic crops.⁹⁷ In India, resources for more extensive research programmes were quickly made available,⁹⁸ and by 1906 Agriculture had become a fully-fledged imperial service on the lines of the Forest Service.

Consequently, the scale of the support being given to botany was questioned increasingly during the 1890s. The steer given by the Lieutenant Governor in response to King's report in 1890-91 was bland enough:

The Report shows that steady progress has been made in improving the Botanic Garden, not only as a scientific centre of the highest value to all botanical students, but also as a pleasurable and instructive resort to the public.⁹⁹

But it was notable that the Lieutenant Governor did not mention work on economic botany, suggesting that little was expected from the Garden in that sphere any more.

More signs that the Government was reconsidering its support for the Garden soon emerged. King's status in India as *primus inter pares* depended partly on the high salary his post attracted (see Introduction).¹⁰⁰ In 1894, however, the Government of India ruled that the Superintendent's salary should be reduced when King retired. After 1870 the value of the rupee had fallen relative to sterling, meaning that the superintendents (and most other British officials), who bought imported goods and intended to retire to Britain, suffered a real cut in their remuneration. In 1871 King had a salary of Rs.1,500 per month which was worth £150. By 1890, despite extra allowances, it was still only worth £150.¹⁰¹ After that the rupee stabilised in value, but at each change of Superintendent the Government of India reduced the salary and allowances so that Prain's total emoluments were about Rs.1,800 (=£135 per month) and Gage got only Rs.1,600 (=£120). King protested on behalf of his successors, and advanced various arguments, including the importance of meeting social obligations:

⁹⁷ McCracken, *Gardens of Empire*, 209.

⁹⁸ 'Faith in Experts and the Soil of Bengal: Scientific Agriculture in Colonial India, c. 1870–1945.' Paper by Ian C. Petrie, Session 49, Association for Asian Studies meeting, 2002.

⁹⁹ RBG Kew MR 227: Lieutenant Governor's Resolution Misc. 2969 on the Annual Report, 1891.

¹⁰⁰ The salary of Rs. 1,500 per month was unchanged since it was first awarded to Roxburgh in 1793.

¹⁰¹ The source for these rates of exchange is B. E. Dadachanji, *History of Indian Currency and Exchange* (Bombay, 1934).

... the Superintendent, unless he deliberately decides to be ungracious, has of necessity to do more than is customary in the matter of social entertainment ... the duty of treating all such visitors courteously and hospitably is doubtless a pleasant one and one which no Superintendent would willingly evade; none the less it is a costly one ...¹⁰²

However, the Government no longer felt that the Garden was important enough to merit a salary much higher than that paid to the generality of IMS doctors.¹⁰³ The status of doctors was rising as their training improved and they were able to achieve better health outcomes.¹⁰⁴ At the same time, botany was playing a smaller part in medical courses as a thorough knowledge of physiology, pharmacology and chemistry became more important. That ultimately led to a severing of the IMS link with the Garden, though not until the 1920s.

There was a further threat to taxonomic botany in 1895, when the Government of India issued a circular, discouraging provincial governments from subsidising the preparation of local floras:

The Secretary of State points out that an exhaustive work on the flora of India is now in the course of publication by Sir J. Hooker assisted by specialists of high scientific reputation, and that this 'Flora', of which 20 parts have already appeared and which is being published at a cost to Indian Revenues of about R1,50,000, will, when completed, form the standard authority on the nomenclature and classification of Indian plants. He considers it desirable that in order to avoid unnecessary expense in future, no works on local floras should be undertaken or substantially subsidised by the various provincial Governments in India without first consulting the responsible officials of the Imperial Botanical Survey and obtaining the sanction of the Government of India.¹⁰⁵

King protested, but the message was clear: the Government of India thought that the botanical catalogue of India was largely complete, and it did not expect to spend much more on it. That reflected the general decline in the enthusiasm for natural history, and particularly botany, as the Victorian era came to an end. Informed people began to believe that most species had been discovered, and Darwin's ideas encouraged an interest in biological processes rather than catalogues of what existed

¹⁰² RBG Kew DC 158: King to Sir Thomas Holderness, India Office, 10th August 1907.

¹⁰³ RBG Kew DC 158: Gage to Prain, 26th June 1907.

¹⁰⁴ W. F. Bynum, *Science and the Practice of Medicine in the Nineteenth Century* (Cambridge, 1994), 94.

¹⁰⁵ RBG Kew MR 107: Circular No. 9/16 from E. D. MacLagan, Under-Secretary to the Government of India, 12th March 1895

where.¹⁰⁶ Fewer officials came to India with an interest in botany or zoology as the fashions for collecting butterflies, plants and ferns declined.¹⁰⁷ The detailed descriptions and technical language required in botany came to be seen as tedious.¹⁰⁸

Whatever the views of the Governments of India and Bengal on the relevance of taxonomic work, there is no doubt that they respected King's talents and achievements. King had played many roles, as a functionary of empire, a researcher, a writer, a business promoter, a garden designer and an educator. He had understood what was expected of him as a natural scientist, as an efficient administrator and as a talented landscape designer, and he got official recognition in return. He had already been elected as a Fellow of the Royal Society in 1887,¹⁰⁹ with Joseph Hooker as his chief proposer.¹¹⁰ In 1893 King was promoted to Lt Colonel. Five years later, his retirement was marked by a knighthood. King was the only Superintendent to be knighted for work in the Calcutta Garden, and one of only 25 IMS officers to be so honoured between 1840 and 1913.¹¹¹ The award recognised King's great achievements, in reviving the Garden and establishing its scientific reputation. When King left Calcutta the Government of Bengal issued a Farewell Notice that generously acknowledged what he had done:

Sir G. King's labours in the fields of morphological and systematic botany have greatly extended our knowledge of the flora of India and the Malay Archipelago, and have established his reputation as a botanist throughout the scientific world. Nor was he less successful as a practical administrator. The striking improvements that have been effected in the past 25 years in the Botanic Garden at Sibpur are due to his business capacity and his talent for landscape gardening.¹¹²

When King left in 1898 Prain was his natural successor and his appointment was almost automatic.¹¹³ He already had some twelve years' experience of working at the Garden, and had stood in for King on several occasions. Prain was fortunate to find

¹⁰⁶ Drayton, *Nature's Government*, 244.

¹⁰⁷ Allen, *The Naturalist in Britain*, 192-3.

¹⁰⁸ *Ibid.*, 182-3.

¹⁰⁹ Crawford, *History of the Indian Medical Service*, 219. Only thirty-three IMS officers were elected between 1840 and 1913, and only two other heads of overseas botanic gardens

¹¹⁰ Royal Society Certificate of a Candidate for Election dated 10th February 1887.

¹¹¹ Crawford, *History of the Indian Medical Service*, 219.

¹¹² Quoted in Buckland, *Bengal under the Lieutenant Governors*, 618.

¹¹³ RBG Kew MR 103: Extract of Letter from the Government of India No. 73, Revenue and Agriculture, 21st October 1897.

Andrew Gage, another botanically inclined member of the Indian Medical Service, to succeed him as Herbarium Curator. But the Government continued to make clear that it was dissatisfied with the results of its investment in botany, and a good deal of Prain's energy went to defending the Garden and the Botanical Survey against further cuts. In a private 10-page letter to Thiselton Dyer in 1903 Prain described in great detail how he exploited his contacts and lobbied the Government of India to retain the post of Superintendent of the Saharanpur Garden.¹¹⁴ He almost succeeded, but in the end the policy decision was upheld and the money was used to pay for a cryptogamic botanist in the Agriculture Department.¹¹⁵ The historic botanic garden at Saharanpur then ceased to be a base for any serious botanical work.

Prain was not superintendent for long. In 1904 Sir William Thiselton Dyer had decided to retire as Director of Kew Gardens, and Prain, who was on leave in Britain, was offered the job.¹¹⁶ Calcutta Botanic Garden suffered by his early departure (he was only forty-seven at the time), but it did mean a continuing close relationship between Calcutta and Kew for the next seventeen years, until Prain retired in 1922. But after Thiselton Dyer left, Kew itself became less influential in official circles, partly because Prain lacked Thiselton Dyer's long experience and connections in Britain.¹¹⁷

King had been a man of vision and a very talented administrator. Prain lacked the vision (and he has been described as a lacklustre Director of Kew),¹¹⁸ but he was still an excellent and hard working botanist who was also very adept at dealing with India's convoluted bureaucracy. After Prain left in 1904, the Garden gradually became less important. It took some time for the Government of India to decide on Prain's successor in Calcutta, but in the end the Gage was confirmed. He was already acting as superintendent, and proved to be a competent administrator, but he failed to grow in the post as his predecessors had. He published little, and was mainly reactive in his dealings with the Government.

¹¹⁴ RBG Kew DC 158: Prain to Thiselton Dyer, 1st January 1903.

¹¹⁵ Arnold, *Science, Medicine and Technology*, 151.

¹¹⁶ RBG Kew Burkill Letters 209: Prain to Burkill, December 1905.

¹¹⁷ See Royal Society Archives: I. H. Burkill's Obituary of David Prain, 1944.

¹¹⁸ McCracken *Gardens of Empire* p. 209

The Garden began to be perceived as a declining institution in Britain too: in March 1906 Prain sent Gage a cutting from the *Journal of Horticulture* suggesting once more that Peradeniya in Ceylon was a more important botanic garden than Calcutta.¹¹⁹ More seriously, the 90 year-old Joseph Hooker wrote in 1907 to Gamble (still serving in the Indian Forest Department), 'Botany seems to be dead in India; some reform is needed. There seems to be no organised scientific force which the Govt. would respect and listen to, ...'¹²⁰ Hooker was right in thinking that all was not well. His complaint seemed to be that the botanists in India were no longer making an effective case for taxonomic work, but it was more complicated than that. As this chapter has made clear, what the Indian Government expected of botanists had changed. The Garden made some attempts to re-orientate its efforts. Prain did useful work on the problems of wheat leaf rust in the 1890s (see Chapter Five) and Gage set up a small laboratory in the Garden. In the Annual Report Gage noted that he was implementing something recommended by Sir Richard Temple 'nearly thirty years ago!'¹²¹ However it was too late to stem the downgrading of the Garden in the Government's eyes, and botanists in India were still seen as being focussed on taxonomy, in contrast to the more physiological emphasis of the work being done at Buitenzorg, and to some extent at Peradeniya.¹²²

In 1907 there was a reorganisation at Calcutta Medical College and the Superintendent ceased to be Professor of Botany.¹²³ As if to emphasise the more horticultural role the Government envisaged for the Botanic Garden, responsibility for the various municipal gardens and the grounds of government establishments in Calcutta was passed to the Garden in the same year.¹²⁴ Then, in 1911, the imperial capital began moving from Calcutta to Delhi, a double blow to the Garden as it lost access to senior officials as well as finding itself left in a city whose status had been downgraded.

There was, however, something of a revival of taxonomic work towards the end of the Edwardian period. That was mainly due to the appointment of two people who

¹¹⁹ RBG Kew DC 158: Gage to Prain, 16th April 1906.

¹²⁰ Hooker to Gamble, 15th January 1907, quoted in Huxley, *Life and Letters of Sir J. D. Hooker*, 400.

¹²¹ RBG Kew MR 216: CBG Annual Report for 1904-5, para. 4.

¹²² Desmond, *European Discovery*, 167; Burkill, *Chapters on the History of Botany*, 203-5.

¹²³ RBG Kew DC 158: Gage to Prain, 26th June 1907.

¹²⁴ RBG Kew MR 216: CBG Annual Report for 1907-1908, para. 9.

were later to become important and influential botanists. One was William Wright Smith who arrived as herbarium curator in Calcutta at the end of 1907. Smith was not a member of the Indian Medical Service, but he was an experienced lecturer from Edinburgh who worked assiduously whilst he was in India. He later became Regius Keeper of the Royal Botanic Garden, Edinburgh. Like King and Prain, he became an FRS and was knighted.¹²⁵ The other significant figure was I. H. Burkill, the assistant Reporter of Economic Products, later to become the Director of the Singapore Botanic Garden.¹²⁶ Along with some Forestry Officers, Smith and Burkill investigated areas where little collecting had been done before, and their published results went some way to countering Hooker's view that botany was dead in India. Smith only stayed until 1911, but Gage did at least get a competent replacement when Charles Cumming Calder arrived in 1912. Calder was the last European appointed to a senior post at the Garden. He took over from Gage as superintendent in 1925 and stayed until 1937 when he was succeeded by the first Indian superintendent, Kalipada Biswas.

Whatever gap there was between the Government and the botanists on what scientific work was needed, they were agreed that there should be a new focus on the Garden as a destination for visitors. As we have already seen, King was a talented landscape designer, and the Calcutta Garden had become increasingly attractive under his management. In the 1890s a less certain imperial government looked to display as a way of reinforcing its prestige.¹²⁷ Encouraging people to use the Garden also reflected the view that an interest in botany could be a way of 'improving' and civilising visitors. King believed that visits to parks and gardens could be 'elevating'. By the 1880s there were palm, fern and orchid houses for visitors to view, and from 1884 the annual report invariably commented on the quality of the orchid display. The significance of display and landscaping will be discussed in more detail in Chapter Six.

The guidebook that King wrote in 1895 had a long section on the history of the Garden. He had used the opportunity of its 100th Anniversary to include a brief historical summary in the annual report for 1886-87. In 1893 and 1895 he wrote

¹²⁵ John F. Riddick, *Who Was Who in British India* (Westport, 1998), 338.

¹²⁶ *Ibid.*, 54.

¹²⁷ Cannadine, *Ornamentalism*, 46-54.

short memoirs of Robert Kyd and William Roxburgh for the *Annals of the Royal Botanic Garden*. Approaching the end of his time in India, and feeling on the defensive, King was increasingly anxious to highlight past achievements, perhaps instinctively recognising that, as Doreen Massey has put it, ‘The identity of places is very much bound up with the *histories* which are told of them, *how* those histories are told, and which history turns out to be dominant.’¹²⁸

Conclusion

By 1914 botany was at last beginning to involve Indian practitioners. The Annual Report for 1913-14 noted that the herbarium had received 3,500 sheets of Travancore plants collected during a tour of the district by Mr C. C. Calder and Mr M. S. Ramaswami, whilst Messrs D. Hooper and S. C. Banerji had collected 800 sheets of Garo Hills plants.¹²⁹ From March 1913 until September 1914 M. S. Ramaswami was acting Curator of the Herbarium, the first Indian to hold a senior post at the Botanic Garden.¹³⁰ This precedent helped to pave the way for a cordial handover to Indian direction in 1937. Particularly under George King’s leadership, the Botanic Garden had contributed largely to the project to catalogue India’s plant life. The publishing work done during his superintendence was more important than anything done before, and he truly realised the ambitions of his predecessors for the Garden to become a ‘centre of calculation’. By 1900 the Herbarium at Calcutta contained over a million specimens, and had become a key resource for botanists in India and elsewhere.¹³¹

However, policy makers were no longer so interested in adding to the already extensive catalogues of India’s resources. There had, in a sense, been an unspoken pact for over a hundred years, whereby the Garden was often quite generously funded. In return, it was always expected to do economic work, but the superintendents and their staff were given reasonable latitude to proceed with their taxonomic project as well. By 1914, that arrangement had ended: the Garden continued to receive its core funding, but it became a less prominent institution,

¹²⁸ Doreen Massey, ‘Places and Their Pasts,’ *History Workshop Journal*, 39 (1995), 186.

¹²⁹ RBG Kew MR 216: Calcutta Botanic Garden Annual Report for 1913-1914, para. 3.

¹³⁰ RBG Kew MR 216: Calcutta Botanic Garden Annual Report for 1914-1915, para. 6.

¹³¹ RBG Kew MR 216: Calcutta Botanic Garden Annual Report for 1904-5, para. 3.

providing only a limited amount of scientific advice. The problem was partly that scientists had become increasingly specialised, and botany could no longer answer many of the questions that administrators were interested in. The Botanic Garden thus provides one example amongst many of how scientific institutions have to adapt constantly to avoid being seen as irrelevant by their sponsors. The decline in support for the botanic gardens in India after the 1890s was linked to declining interest in natural history in Britain. Whilst British interest declined, however, Indian interest increased.¹³² By 1916 K. Ranga Achari, Government Lecturing Botanist, at the Agricultural College, Coimbatore, found it worthwhile to publish a 360-page teaching manual,¹³³ and two years later Calcutta University set up India's first department of botany.¹³⁴ Within five years four other universities had followed suit.¹³⁵

In the field of economic botany, the Garden continued to ensure that cinchona was produced efficiently. From the 1890s, the Government turned to newer institutions such as the Forestry Department and the Agricultural Department, to increase the productivity of Indian agriculture, and by 1914 both had well-resourced training and research facilities. That was not wholly to the disadvantage of the Botanic Garden: it did mean that there was a larger group of people whose professional concerns involved plants, who sometimes wanted specialist botanical advice, and needed to consult the herbarium.¹³⁶

The period from 1871 to 1914 also marked the highpoint of the relationship with Kew, cemented particularly by the work on Hooker's *Flora of British India*. Kew and the Botanic Garden aligned their interests very closely, but neither institution could counter the declining British interest in taxonomic botany after the 1890s. By 1914 Kew was less influential in Britain, so less able to muster political support for the Calcutta Garden, even though the professional relationship remained strong.¹³⁷

¹³² Kumar, *Science and the Raj*, 123

¹³³ K. Ranga Achari, *A Manual of Elementary Botany for India* (Madras, 1916).

¹³⁴ Although some colleges (as opposed to universities) had been teaching botany since the 1870s.

¹³⁵ Arnold, *Science, Medicine and Technology*, 191.

¹³⁶ RBG Kew MR 107: Prain to Gage, 8th May 1907.

¹³⁷ The relationship has remained strong into the twenty-first century, and a liaison officer from the Botanical Survey of India is still posted regularly to Kew.

Finally, this period was important for the emergence of the Garden as a site for the inscription of British ideals of beauty and landscaping. King's remodelling of the site finally made it what all botanic gardens must aspire to be, a place to enjoy the beauty of plants. At the same time, it was hoped, citizens could use their leisure healthily and instructively, and appreciate the Empire's ability to transform a landscape and command plants to grow where it wished (see Chapter Six).

Chapter Five

The Utility of the Garden

Previous chapters have made it clear that most superintendents saw the description and recording of the flora of South Asia as their main task. However, they were all aware that the original impulse to found the Garden had been an economic one, and they knew that they had to respond appropriately to pressures from the governments in India and in Britain. This chapter aims to situate the Garden within the British attempt to take advantage of India's economic resources.

The eagerness of the superintendents to do economic work varied. In a reflective letter written in 1907, David Prain, who was by then the Director at Kew, drew up a list of the various botanists who had worked in India, and what their strengths had been.¹ His views are tabulated below:

Table 4. The main strengths of the leading botanists who worked in India

<u>Name</u>	<u>Main strength: survey work (i.e. scientific botany)</u>	<u>Main strength: technical (i.e. economic botany)</u>
Koenig (Madras)	Scientific	
Kyd		Technological/Agricultural
Roxburgh	Scientific	Technical
Buchanan Hamilton	Scientific/Economic	
Wallich	Scientific	
Wight (Madras)	Scientific	
Royle (Saharanpur)		Technological/Agricultural Pharmacographical
Griffith	Scientific/Morphological	

¹ RBG Kew DC 158: David Prain to Andrew Gage, 8th May 1907.

Falconer	Scientific	
Jameson (Saharanpur)		Agricultural/Technological
Thomson	Scientific	
Anderson	Scientific	Technical
Clarke	Scientific	
King	Scientific	Technical

In Prain's view only Roxburgh, Anderson and King (shown in bold) had distinguished themselves in both fields (though he might have included himself as well). He tried to make clear his distinction between scientific and economic botany: 'The technical application of the economic information obtained (in a botanical survey) is an essential corollary to survey work proper, but it does not form part of that work.'²

Prain was an astute observer, but he set up too much of a dichotomy. There has been a good deal of debate about these ideas of pure and applied science. Michael Adas suggests that we can distinguish between scientific endeavour, which aims to produce knowledge of the natural environment, and technology, the effort to exercise a working control over the environment.³ Ashis Nandy disagrees, and argues that it is very difficult to distinguish between science and technology. In mega-government enterprises like space science, the "pure" science of astronomy is inextricably linked to the practicalities of satellite technology.⁴ Bruno Latour goes further, and conflates most scientific and investigative activities, saying that:

There is not the slightest difference between social sciences and natural sciences – all depend on same basic mechanisms – calibrating inscription devices, focussing the controversies on the final visual display, obtaining the resources necessary for the upkeep of the instruments, building nth order theories on the archived records.⁵

Adas postulates a theoretical distinction, but it probably does not bear much relation to what actually happens in a scientific institution. Latour, on the other hand, usefully

² RBG Kew DC 158: David Prain to Andrew Gage, 8th May 1907.

³ Adas, *Machines as the measure of man*, Introduction.

⁴ Ashis Nandy (ed.), *Science, Hegemony and Violence* (Tokyo/Delhi 1988), Introduction.

⁵ Latour, *Science in Action*, 254.

points out how all modern investigators use similar methods, seeking evidence based conclusions, but he fails to capture the real life ‘working worlds’ in which institutions exist. Certainly, it is true that all botanists need a good scientific and taxonomic training before they can investigate anything effectively, and Joseph Hooker was right to maintain that ‘an accurate scientific guide to the flora’ was fundamental to economic and medical botany (see Chapter Three). What superintendents actually did, however, depended on the pressures on them and on what seized their imagination. There was never a precise and clear line to be drawn between ‘technical’ and ‘scientific botany’. Anderson and King were the most talented and effective of the superintendents precisely because they were able to initiate and set up cinchona plantations in Sikkim whilst at the same time using these new outstations to provide extra space for botanical experiment, and the scientific investigation of plant life in the hills.

This chapter starts by outlining the history of plant transfer, and the involvement of botanic gardens. It shows how certain officials, and other British residents, regularly exerted pressure on the authorities in India to introduce new crops and ‘more advanced’ agricultural techniques. The official response varied, so the superintendents had to monitor carefully what was expected of the Garden. It was always of prime importance for the Garden to retain official support, and the chapter will argue that it did that, and sometimes attracted additional resources, by skilfully handling official requests to experiment with economic plants, by taking the initiative in suitable circumstances, by making successful use of its networks and contacts, and by maintaining a productive dialogue about its successes whilst being candid about its failures. The chapter goes on to examine the major introductions in detail. It shows the botanical complexity of the plants concerned, and the importance of looking at actual practices. The evidence from India is that introducing new crops was always difficult.

Plant transfer, natural resource policies and the Botanic Garden

The key historical importance of plant transfer has been outlined in the Introduction. Transfers between the years 1500 and 1800 greatly increased humanity’s ability to produce food, and led to large increases in population. During that period, major

American food crops were introduced into South Asia, including maize, potatoes, cassava, peanuts, sweet potatoes, tomatoes, pumpkins and squashes, as well as chillies, pineapples, guava and tobacco.⁶ These transfers were informal and rarely involved botanic gardens or other official institutions. In some cases these new crops became so much a part of the local food culture that their foreign origin was forgotten.⁷

Occasionally, however, there were successful transfers that were officially sponsored. In his original proposal for setting up the Botanic Garden, Robert Kyd cited the example of the Duc de Bourdonnais, who brought manioc (cassava) from Brazil to the Île de France⁸ and Reunion, ‘thereby banishing the spectre of starvation from those islands.’⁹ Sir Joseph Banks reinforced Kyd’s case by pointing out that the French state had introduced nutmegs and cloves there as well.¹⁰ Kyd and Banks thus implanted in the minds of British decision makers the notion that crop transfer could be a means of eliminating famine and increasing exports. The apparent French success on the Île de France became a potent myth, helping to provide a favourable climate for the work of the Botanic Garden during its first forty years.

There were also more immediate reasons for the authorities in British India to introduce economic crops. By the early nineteenth century British textiles from the new mechanised mills, which spun and wove American cotton, were competing successfully with cloth from India.¹¹ As a result India lost one of its main markets, and needed to find new exports to pay for its imports from Britain, and for the overseas charges (the dividends, pensions and transfers that the East India Company needed to pay in Britain). Since India’s manufactures could no longer compete, and tariffs often discriminated against Indian producers, it gradually reverted to being an exporter of raw materials. Most of those raw materials in the early nineteenth century were agricultural – indigo, opium, cotton, and, for a short time, sugar.¹² However, India was far from Britain and freight rates were high, so finding viable export crops

⁶ Crosby, *Colombian Exchange*, 191.

⁷ George Watt, quoted in *The Colombian Exchange*, 192.

⁸ Now known as Mauritius.

⁹ BL IOR H799: Kyd’s letter of 26th April 1786 to Council.

¹⁰ DTC Vol V f.184 Banks to Dundas, 15th June 1787.

¹¹ Dietmar Rothermund, *An Economic History of India*, 21.

¹² *Ibid.*, 24-27.

was a continuing problem throughout the century. Apart from the improvement of crops, the East India Company had other reasons to be interested in natural resources. From the beginning of the nineteenth century officials worried about the supply of good timber for construction, for shipbuilding and for military use. In addition, many Company officials looked on horticulture as a worthy and improving activity, and saw botanic gardens as a means of encouraging it.

From the late eighteenth century onwards there was always a strand of official thought arguing that the Government should devote resources to ‘improving’ India and promoting economic and agricultural development. Robert Kyd himself saw the Garden as an instrument of improvement.¹³ In an early discourse on trade and development, H. T. Colebrooke quoted the view of a committee of the Court of Directors that, ‘The natives of India are equally British subjects; and every mind must revolt at an attempt to prevent those natives from improving the produce of their soil, by their ingenuity and labour.’¹⁴ Even a Governor General could say:

It is impossible not to deplore the same defective state in the Agricultural, as in every other science in this country. Look where you will – examine the whole scheme of the Indian System, and you will find the same results – poverty, inferiority, degradation in every shape. For all these evils knowledge, knowledge, knowledge, is the universal cure.¹⁵

In the same vein, Clements Markham, the India Office official who orchestrated the transfer of cinchona, claimed: ‘It is by adding to the sources of Indian wealth that England discharges the immense responsibility she had incurred by the conquest of India, so far as the material interests of that vast empire are concerned.’¹⁶

The government response varied, and as late as 1878 Sir Ashley Eden, who succeeded Sir Richard Temple as Lieutenant Governor, opposed any intervention, writing: ‘The Government of Bengal has no Agricultural Department, and does not attempt to teach the Bengali cultivator his business, believing that he already knows

¹³ BL IOR H799: Kyd’s letter of 1st June 1786 to Council.

¹⁴ H. T. Colebrooke, *Remarks on the Husbandry and Commerce of Bengal* (Calcutta, 1795), 172.

¹⁵ Lord William Bentinck’s reply to the Society’s Address, read on 8th April 1835, *Transactions of the Agri-Horticultural Society* Vol. II, LXXVII, 250.

¹⁶ Clements Markham, *Travels in Peru and India*, (London, 1862), 60.

how to make the most of the soil and the material available to him ...¹⁷ However, the interventionist pressures gradually prevailed, and the writers on agricultural and economic questions had a cumulative impact. Their published works¹⁸ contributed to a climate in the 1870s and 1880s where Lieutenant Governors like Campbell and Temple, and civil servants like E. C. Buck, pressed the Botanic Garden to experiment further with crops that might succeed in India.

At the beginning of the nineteenth century the East India Company assumed that the Calcutta Garden would provide any expertise needed to introduce and acclimatise new crops. The blithe assurance of that time is reflected in Lord Valentia's comments after he visited Calcutta:

Utility seems to have been more attended to than science. Thousands of plants of the Teak tree, the Loquot, the grafted Mango, and other valuable fruit and timber trees, have from this place been disseminated over our Oriental territories; and at present it is a complete centre where the productions of every climate are assembled, to be distributed to every spot where they have any chance of being beneficial.¹⁹

During the rest of the nineteenth century the Garden experimented with many plants that might benefit the Indian economy. It investigated food crops, including sugar (in collaboration with the Agri-Horticultural Society) and potatoes, as well as reporting on the races (subspecies) of wheat, mustard and pulses in Bengal in the 1890s. There was much routine work on introducing improved varieties of fruit trees and vegetables, and attempts to acclimatise spices such as cinnamon, nutmeg and pepper. Trees, shrubs and vegetables were introduced to other parts of India, or sent overseas. The Garden also worked on many beverages, narcotics and medicines. Whilst its most important success was the introduction of tea, it also acted as a reception point for coffee and cocoa plants which were transmitted to more tropical parts of India, and to other British controlled territories.²⁰ Attempts to introduce

¹⁷ Buckland, *Bengal under the Lieutenant Governors*, 707.

¹⁸ Colebrooke's *Husbandry and Commerce*, Henry Piddington's *On the Scientific Principle of Agriculture* (Calcutta, 1839), J. Forbes Royle's *Essay on the Productive Resources of India* (London, 1840) and George Watt's *A Dictionary of the Economic Products of India* (Calcutta, 1889) were all influential. Wallich himself also provided valuable economic information in 1832 in his answers to questions from the Parliamentary Select Committee on the Affairs of the East India Company.

¹⁹ George Valentia. *Voyages and Travels to India, Ceylon, and the Red Sea, Abyssinia and Egypt in the Years 1802-1806*, (London, 1811).

²⁰ King, 'Sketch of the History of Indian Botany,' 12.

medicinal plants such as ipecacuanha were generally less successful, but the transfer of cinchona to India was a significant achievement. Research on narcotics included experiments on tobacco cultivation, and specialist advice on the growing of opium, cocaine and marijuana.²¹

In addition, there was work on timber, fibres and dyes. In its early days, the Garden expended much effort on trying to grow teak in Bengal.²² It was ultimately more successful in introducing mahogany from the Caribbean. It acted as a clearinghouse for transmitting the seeds of other good timber trees such as sal (*Shorea robusta*) to various parts of India,²³ and played a role in the successfully introducing some Himalayan species to Britain, including the deodar (*Cedrus deodara*), the Bhutan pine (*Pinus wallichiana*), rhododendrons, azaleas and orchids. Much effort was devoted to fibres – not only to cotton (again in conjunction with the Agri-Horticultural Society), but also to various grasses, bamboos and other plants for papermaking, and to hemp and sisal for cordage. Finally, the Garden took part in the experiments on indigo during the attempts to save the industry in the 1900s,²⁴ and worked on plants that produced tanning products and vegetable oils. Apart from all the attempted introductions, plants were sent from India to other tropical botanic gardens, as part of an empire wide improvement process, with Indian trees and plants being introduced to many locations in Southeast Asia and Africa.

As the century progressed, however, it became clear that there were many barriers to implementing these economic and ameliorative proposals. It took a long time for the botanists to learn about the suitability of soils, cultivation and propagation techniques, and the need to transfer plants, when necessary, to other gardens with more suitable climatic conditions. Even when the Botanic Garden was able to show that a crop was viable in India, it was often impossible to persuade planters or agricultural middlemen to invest their capital and take the risk of growing something on a large scale. That might be because of disease, or shortage of suitable labour, or high transport costs, or falling prices on the world market. The introduction of tea

²¹ Ibid.

²² George King, *A Guide to the Royal Botanic Garden, Calcutta* (Calcutta, 1895), 5.

²³ BL IOR F/4/1949 no. 72126: Wallich's 1840 Report on Calcutta Botanic Garden, para. 7.

²⁴ RBG Kew MR 216: Calcutta Botanic Garden Annual Reports for 1900-01 and 1901-02, para. 2.

offers the best example of how those problems could be overcome, but even that project almost foundered in the 1840s

Tea and other work in economic botany, 1820-60

Although attempted crop introductions in the Garden's early years had depended on Kyd and Roxburgh, the Government gradually took the initiative after 1820.

Roxburgh's departure in 1813, and the loss of his expertise, led to a decline in the amount of acclimatisation work. The perceived need to continue it was one of the reasons why William Carey²⁵ then proposed the formation of the Agri-Horticultural Society. Carey had wide botanical and agricultural interests and was concerned about the 'backwardness' of Indian agriculture. He therefore promoted a sort of physiocratic²⁶ programme to introduce the benefits of the British agricultural revolution. The Society also promoted gardening, and hoped that by introducing improved varieties of fruit and vegetables, it would be able to implant good horticultural habits.²⁷ Carey was able to bring together a group of interested senior British administrators and planters, together with some leading Bengali landholders and merchants, which made the Society immediately influential when it started work in 1820.²⁸ As a result it was able to attract quite generous government support.²⁹

²⁵ For details of Carey's role in India see Chapter One.

²⁶ In the sense that Richard Grove uses the word – see *Green Imperialism*, 189.

²⁷ See Carey's presidential introductory discourse (September 1824), reprinted in *The Transactions of the Agricultural and Horticultural Society of India*, Vol. I (1837).

²⁸ Unlike many societies in colonial India, the Agri-Horticultural Society was determinedly multiracial and its constitution specified that it should have an Indian, as well as a European, Secretary. At times it became largely European but always had at least 10% of Indian members. See Mukherjee, 'Natural Science in Colonial Context: the Calcutta Botanic Garden and the Agri-Horticultural Society of India, 1787-1870'.

²⁹ BL IOR F/4/1230 no. 40269, and F/4/1240 no. 40599.



Figure 17. Carey's continuing presence: the bust outside the Agri-Horticultural Society's offices in Kolkata in 2013.

The foundation of the Agri-Horticultural Society posed a dilemma for Wallich as it was proposing to do some of the work previously done at the Botanic Garden. But Wallich had little time to devote to economic botany (see Chapter Two), and he was a good friend of Carey. So he offered collaboration, and was Honorary Secretary of the Society from 1822 until 1828.³⁰

At the same time the government in Calcutta began to make clear what it wanted the Botanic Garden to work on. By the 1830s it was proposing work not only on agricultural and plantation crops, but also on medicinal and horticultural plants. The Government adopted a system of committees to implement some of its improvement policies, and the Agri-Horticultural Society can be seen as an early example of that approach. It set up a plantations committee to support Wallich in

³⁰ Dudeja (ed.), *In Full Bloom*, vii.

examining timber resources in 1823,³¹ and then a high level Tea Committee when it decided to attempt the introduction of tea growing in 1834.³²

In 1829, a year after Wallich went on leave, Bentinck's Finance Committee carried out the first official assessment of the value of the Botanic Garden. As noted in Chapter Two, the assessors were unimpressed with the economic outcomes of the Garden's work. Two years later, when Wallich was still in Britain, he was questioned by the Parliamentary Select Committee on the Affairs of the East India Company. The Committee probed him on the prospects for a very wide range of crops. Wallich's replies were carefully balanced. He admitted that coffee and certain fruit trees had been the only successful introductions in his time, but saw scope for the improvement of many other crops if only Indian farmers would exert themselves more. He was deploying an argument often used by the British to account for their lack of success in introducing "improvements" when he attributed India's poverty to this lack of exertion.³³ However, he concluded positively: 'India is very productive; it only requires skill, ingenuity and encouragement to natives and Europeans to select everything that can possibly be desired.'³⁴ Wallich was not given a chance to defend his previous work directly, but the general tone of his comments, that India could be made more productive if there was more experiment and education, pointed to a continuing role for the Botanic Garden.

Wallich thus returned to India in 1833 with a strong incentive to show results in economic botany. He attempted that partly by working more closely with the Agricultural Society. In the 1820s the Society had an enthusiastic programme of plant and seed importation, flower shows and competitions for gardeners.³⁵ But at the end of the decade it decided to focus more on agriculture, and with government support it used various plots of land outside Calcutta. However, it was not able to occupy any site for long, and consequently became anxious to have a more stable

³¹ BL IOR P/11/2: First Report of the Plantations Committee, 17th April 1823.

³² Harold Mann, 'The Early History of the Tea Industry in North-East India', *Bengal Economic Journal*, 1918, 5.

³³ Report of the Parliamentary Select Committee on the Affairs of the East India Company: Evidence II, 13th Aug 1832 para. 2345.

³⁴ Ibid. 14th August 1832, para. 2462.

³⁵ Dudeja (ed.), *In Full Bloom*, 7.

base.³⁶ Wallich responded in 1836, by offering part of the Botanic Garden for the Society's experimental work.³⁷ For the next thirty or so years there was close collaboration between the Garden and the Society, and the area that it used expanded to some twenty-five acres (ten hectares).

As a result of Government pressure, Wallich wrote the first proper reports on the Garden's work in 1836 and 1840 (see Chapter Three). They provide an insight into the work being done in economic botany at the time. In 1840 he noted that some 80,000 improved sugar plants had been distributed from the Agri-Horticultural Society's nursery, mainly to Society members. By that time he also reported that 'vast quantities'³⁸ of tea plants and seeds were being distributed from the Garden itself, as well as 'a great many thousand Arabian coffee seedlings.'³⁹ However, Wallich had many setbacks, and in an illuminating paragraph he showed how the Garden was slowly coming to understand the difficulties of plant introductions:

None but those who have for years had to struggle against the impediments, which oppose themselves to the introduction of foreign plants here, and what is of far more importance, their propagation and dissemination all over the country, can form any just estimate of the discouraging circumstances, which are often encountered at every step almost.⁴⁰

Wallich followed this by listing various introductions that had failed to flourish in Calcutta, including nutmeg, cloves, grape vines, orchids and breadfruit trees. The point to note, however, is that he made it clear for the first time that propagation and dissemination could be even more of a challenge than the introduction itself.

Looking back in 1895 on the Garden's collaboration with the Agri-Horticultural Society, George King recorded that:

In the improvement of Indian cotton, and in the introduction both of that and of jute to the markets of Europe, the Garden authorities worked cordially hand in hand with the Agri-Horticultural Society, and with what success it is unnecessary to point out. By the introduction of some of the best kinds of sugarcane from the West Indies, and the dissemination of these to all parts of the country, a

³⁶ Mukherjee, 'Natural Science in a Colonial Context', 188-204.

³⁷ Ibid., 206-7.

³⁸ BL IOR F/4/1949 no. 72126: Wallich's 1840 Report on Calcutta Botanic Garden, 4.

³⁹ Ibid., 3.

⁴⁰ Ibid., 4.

considerable improvement was effected in the quality and quantity of the sugar crop of the country.⁴¹

King wanted to present the Botanic Garden and the Agri-Horticultural Society as successful institutions, and to persuade the Government that they had made a valuable contribution to increasing agricultural productivity. He was, therefore, generous in his comments, and glossed over the difficulties encountered in trying to improve crops in India. The Agri-Horticultural Society had in fact made little progress in solving India's agricultural problems during its seventy-five year existence. Food production remained insecure, and in 1866 Anderson reported that, 'a fearful famine is raging near us, especially in Orissa.'⁴² That was the start of a series of famines in the 1860s and 1870s, and it became evident that a well meaning but poorly funded society without professional expertise was unlikely to be able to introduce significant improvements. After 1872, the Society began to focus more on horticulture and ornamental gardening. In contrast, the Botanic Garden, having employed two qualified curators to support the superintendent, was able to offer more professional expertise: John Scott, the garden curator, was seconded to advise on opium cultivation in the early 1870s, whilst Sulpiz Kurz, the herbarium curator, was sent to Burma to look at forest products.⁴³

It is true, however, that the relationship between the Botanic Garden and the Agri-Horticultural Society during the thirty years from 1835 suited both parties,⁴⁴ and Wallich's decision to support rather than compete with the work of the Society was wise. The superintendents between 1835 and 1861 – Wallich, Griffith, Falconer and Thomson – were all characterised by Prain as being more interested in scientific botany, and the presence of the Agri-Horticultural Society's plot enabled them to associate the Garden with economic botany without much involvement on their part.⁴⁵ The collaboration came to an end in the mid-1860s, when Thomas Anderson was planning to landscape the Garden, and asked the Society to vacate its plot so that he could use it for order beds.⁴⁶ For a short time the Society again had no base, but in

⁴¹ King, *A Guide to the Royal Botanic Garden, Calcutta*, 6.

⁴² RBG Kew DC 155 Indian letters: Thomas Anderson to Joseph Hooker, 22nd January 1866.

⁴³ His research was published in 2 volumes as *The Forest Flora of British Burma*, (Calcutta, 1877).

⁴⁴ King, *A Guide to the Royal Botanic Garden, Calcutta*, 6.

⁴⁵ Arnold, *The Tropics and the Travelling Gaze*, 107.

⁴⁶ RBG Kew DC 155: Anderson to Joseph Hooker, 22nd February 1865.

1872 the Government provided a twenty-acre (eight-hectare) plot in Alipore, a pleasant suburb five kilometres south of the centre of Calcutta.⁴⁷

Tea was the most important commercial crop that was introduced into nineteenth-century India. It is worth looking at the process in detail in order to understand how the Botanic Garden related to the other parties involved. Sir Joseph Banks had suggested to the Directors of the East India Company as early as 1788 that tea could be grown in India.⁴⁸ At that time, however, the Company was buying tea in Canton with the proceeds from Indian opium that was smuggled into China, so there was no longer a drain of bullion, and profits were high.⁴⁹ Consequently no one tried to follow up Banks's proposal for over forty years.

In 1824-25 British forces advanced up the Brahmaputra Valley as part of the first war against Burma. They subsequently occupied other areas so that by 1838 the whole of modern Assam was under East India Company control. British officers based in Assam started to report that tea was growing there. In the late 1820s samples of the leaves were sent to Calcutta Botanic Garden,⁵⁰ but Wallich said that he was unable to identify them positively as *Camellia sinensis*, the tea plant that grows in China, until he had samples of flowers and seeds as well as leaves.⁵¹

By the 1830s, however, the East India Company had become interested in introducing tea growing. Whilst on leave in Britain in 1832, Wallich was asked to write a report on tea for Charles Grant.⁵² In the following year the Government of India Act took away the East India Company's monopoly of trade with China, and with it the Company's incentive to maintain the status quo. At the same time, there was concern that the tea supply might be disrupted because of the rising tensions

⁴⁷ It is still a flourishing institution on the same site.

⁴⁸ NHM DTC VI 103-111: Sir Joseph Banks to Deputy Chairman, EIC, 27th December 1788.

⁴⁹ Rothermund, *Economic History of India*, 25-26.

⁵⁰ Mann, 'Early History of the Tea Industry in North-East India', 6.

⁵¹ Chakervarti, B. B, 'Introduction of Tea plantation in India', *Bengal Past & Present (BPP)*, LXI (1941), 5.

⁵² Parliamentary Papers, Reports from Committees, East India Company's Affairs II Finance and Accounts (Trade), 1831-32: Appendix No. 21. *Observations on the Cultivation of the Tea Plant, for commercial purposes in the mountains of Hindostan*. Drawn up at the desire of the Rt. Hon. Charles Grant, President of the Board of Control for Indian Affairs, by Dr Wallich, 3rd Feb 1832.

with China, which were to culminate in the First Opium War in 1839-42.⁵³ Both economic interests and national pride were involved. The original 'Proposition to cultivate tea', circulated in Calcutta in 1834, denigrated China and argued that, '... our Indian fellow subjects will thenceforth enjoy the tribute hitherto paid by Europe to their uncourteous eastern neighbours for the most innocent and refreshing of all luxuries.'⁵⁴

By that time Wallich had received tea seeds and flowers from Assam, and identified them as *Camellia sinensis*. The Government then set up the Tea Committee, and instructed it to organise this first official attempt to transfer a major crop.⁵⁵ In the 1830s, the Government still believed that leaders of the Indian community had a role to play in economic initiatives so Radhakant Deb and Ram Comul Sen, stalwarts of the Agri-Horticultural Society,⁵⁶ were both appointed to the Committee.⁵⁷ By the 1840s, however, the attitude changed, and it was not until the 1890s that Indian experts again began to be appointed to such official bodies.

In early 1835 the Tea Committee decided to send a scientific delegation to see for themselves where the tea was growing, and to advise on the most suitable places for setting up tea gardens.⁵⁸ The delegation left Calcutta in August 1835, but did not reach Assam until January 1836.⁵⁹ The long march in was the occasion of the rift, discussed in Chapter Three, between Wallich and Griffith and M'Clelland, the younger botanists who accompanied him. After their investigations they all agreed that tea was growing in various locations in Assam, but they disagreed on how to proceed:

As to whether it was necessary to import Chinese tea seed, there was, as we have already hinted, a violent difference of opinion between Wallich and Griffith. The former held that there was no need: the latter that Chinese seed is required Griffith's position was thoroughly logical. A wild plant is not likely to give as good produce as one which has been cultivated for many generations. But the result of

⁵³ Chakervarti, 'Introduction of Tea plantation in India', 5.

⁵⁴ G. T. Gordon, Proposition to cultivate tea, Revenue Consultation 4, 4th February 1834, quoted in Chakrabarti, 'Introduction of Tea Plantation in India', 63.

⁵⁵ Brockway, *Science and Colonial Expansion*, 27-28.

⁵⁶ BL IOR F/4/1586 no. 64547: Minutes of elections to the Agri-Horticultural Society, 4th Jan 1832.

⁵⁷ Ibid.

⁵⁸ Mann, 'The Early History of the Tea Industry in North-East India', 9.

⁵⁹ Ibid., 9.

its adoption has been disastrous. As a result of it Gordon was sent back to China, and for many years China tea seed was brought over regularly, and every thing was done to plant it instead of the “wild” indigenous tea of Assam. Wallich was illogical, but he was right; Griffith was logical, but the result of his recommendation was disastrous.⁶⁰

The disaster was that the vigorous Assam plant was more productive, but became less so when it hybridised with the imported Chinese plants. There was some compensation, however, as the Chinese variety proved more suitable for tea grown in higher areas such as Darjeeling.

Calcutta Botanic Garden played an important role for the next twenty years, germinating seeds and nursing plants that were imported from China, assisted by the efforts of a British plant hunter, Robert Fortune.⁶¹ From 1836, Wallich worked closely with Major Jenkins, the Commissioner in Assam, to set up the first tea plantations. Wallich interested himself not only in the transport and cultivation of tea, but also conducted a considerable correspondence on ancillary matters such as the supply of labour. He helped to receive and administer the groups of Chinese tea-makers who came, and investigated the terms on which indentured labourers in places such as Mauritius served.⁶² He thus ensured that the Garden was closely associated in the official mind with the successful introduction of tea growing.

The Assam Company was founded in 1839 to provide capital to get the industry started, and by 1841 some 2,600 acres (1,000 hectares) were being cultivated. However, failure to control costs, and disease amongst the Company’s staff and labourers, meant that the whole enterprise very nearly failed in the mid-1840s.⁶³ It was rescued by new managers, who were able to build on experience and gradually improve picking regimes and productivity. From 1848, the Assam Company started to make modest profits. In 1855 production reached 250,000 kgs, although that only represented 3% of British imports. From then on there was continuous expansion:

⁶⁰ Ibid., 12.

⁶¹ Fortune’s role in the introduction of tea growing to India has been exaggerated. By the time he sent his first plants from China in 1848 the industry was beginning to flourish in Assam. He was however the first British person to reach the main tea growing areas and he provided some useful insights into processing methods. See Sarah Rose, *For All the Tea in China* (2010).

⁶² See for instance CNH Kolkata Wallich Correspondence: Memorandum of expenses of Chinese workers, June 1841.

⁶³ Mann, ‘The Early History of the Tea Industry in North-East India’, 19-34.

production doubled by 1860, and by 1885 exports had reached 35,000,000 kgs.⁶⁴ By the end of the century, India had captured 90% of the British market.

The introduction of tea growing to India was a useful lesson in the difficulties of transferring an economic crop to another country. The botanists did manage to identify the plant, but had little idea of where it could be cultivated successfully. That needed a long process of trial and error by the planters. Calcutta Botanic Garden did, however, play a major role as a nursery and distribution centre. Although Assam became the most important tea producing area, tea gardens were also established in Kumaon, the Nilgiri Hills and Ceylon, and much of their initial plant stock came from Calcutta. Success with tea was very important in sustaining the reputation of the Garden through the 1840s and 1850s, when it was doing little else to improve Indian agriculture.

The introduction of tea growing coincided with a wider push to improve the crops of India. This was epitomised in John Forbes Royle's *Essay on the Productive Resources of India*, published in 1840. Royle had been Superintendent of the Saharanpur Garden from 1823-31 but had then returned to England (see Chapter Three). In his introduction he said that he had written the book to bring together all the information available on economic plants in India⁶⁵ and his work was an articulate plea for further investment in order to develop India's agricultural potential. Royle pointed to, 'an unacceptable discrepancy between its natural riches and the quality of the different productions, when compared with similar products from other countries.'⁶⁶ This idea that India was somehow failing to realize its economic potential was reiterated by several other writers.⁶⁷ Royle devoted some fifty of his 460 pages to tea, but also surveyed at length what had been achieved with sugar, opium, cotton and tobacco, and considered how their prospects could be improved. He highlighted the contribution of Calcutta Botanic Garden, and thus helped to make East India Company officials and others aware of the value of its work.

⁶⁴ Pettigrew, Jane, "The Origins of Indian Tea", in *Tea Muse*, Monthly Newsletter, August 2000 (http://www.teamuse.com/article_000803.html) accessed on 7th February 2014).

⁶⁵ Royle, *Essay on the Productive Resources of India*.

⁶⁶ *Ibid.*, Preface, iii.

⁶⁷ e.g. in Piddington, *On the Scientific Principles of Agriculture*.

The publication of Royle's book coincided with another significant change, the revival of Kew as an imperial coordinating body. As far back as 1787, Sir Joseph Banks was suggesting that Kew might become 'a great botanical exchange house for the empire.'⁶⁸ By 1838, however, John Lindley was writing:

That no communication is maintained with colonial gardens is apparent from the garden-book of deliveries ... It will be seen from this document, that since the year 1830, the only deliveries to colonial gardens ... have been one to the garden of New South Wales, and one to Lord Auckland, when proceeding to his government in India.⁶⁹

After noting the size and expense of the colonial botanical network, Lindley stated:

A National Botanical Garden would be the centre around which all those minor establishments should be arranged ... Medicine, commerce, agriculture, horticulture and many valuable branches of manufacture, would derive considerable advantages from the establishment of such a system.⁷⁰

Lindley's proposal was never officially endorsed, but it was very influential, and Kew often behaved as if it was the formal imperial coordinating centre.⁷¹ When he took over in 1841, one of William Hooker's early acts was to set up a Museum of Economic Botany, and colonial gardens were pressed to contribute to it. Soon Kew was becoming, '... a testing ground for trials in botanical acclimatization, a project in remaking nature to suit the new industrial order.'⁷² Hooker saw the mobilisation of worldwide botanical resources for the improvement of imperial agriculture as a key argument for increasing Kew's budget.⁷³

The superintendents in Calcutta were slow to take advantage of these new developments. That was one of the reasons for Joseph Hooker's claim in 1855 that the medical and economic departments of botany in India were at a standstill.⁷⁴ In this sense, Falconer and Thomson were both a disappointment to Kew, but its

⁶⁸ Quoted by Endersby, *Imperial Nature*, 233.

⁶⁹ British Parliamentary Papers. Report made to the committee appointed by the Lords of the Treasury in January 1838 to inquire into the management and present condition of the Royal Gardens at Kew, by Lindley, John, and others, 1838 (House of Commons Accounts and Papers, No. 292, Vol. XXIX.259, 1840), 3.

⁷⁰ *Ibid.*, 5.

⁷¹ Drayton, *Nature's Government*, 156.

⁷² Livingstone, *Putting Science in its Place*, 55.

⁷³ Endersby, *Imperial Nature*, 233.

⁷⁴ Hooker and Thomson, *Flora Indica*, Introductory Essay, 3.

powers were limited. There was no chain of command from the India Office to Kew to the colonial botanic gardens; pressure had to be exerted via informal networks, with many interest groups involved and several institutions to be placated.⁷⁵ Writing from the point of view of another botanic garden, Peradeniya, Sujit Sivasundaram, discussing the views of writers such as Richard Drayton, who saw Kew as a powerful coordinating force, suggests that, ‘... when that subject is turned inside out, it looks different if we have Peradeniya in central focus rather than Kew. The fragility of Kew’s reach is more apparent.’⁷⁶ Locality was always a significant factor, and Kew had to calibrate its relationship with each colonial botanic garden in a different way to take into account how things were done in each place.

Lindley had mentioned horticulture as one of the important practical roles for his planned imperial scheme. That reflected a belief amongst educated people in the mid nineteenth century that the growing of plants for ornamental and garden use was important. In the first place, gardening was becoming more and more popular in Britain, and was regarded as a virtuous activity, useful for improving the availability of fresh food.⁷⁷ Aware of that, Wallich in his evidence to the Parliamentary Select Committee said that more Indians were coming to enjoy gardening.⁷⁸ In his 1836 report to the Governor General, Wallich argued that the free distribution of seeds and plants from the Botanic Garden should continue, as there were no ‘native’ nurserymen in Bengal.⁷⁹ He believed that by making seeds and plants freely available the Garden was contributing to the spread of European habits: gardening “improved” people by making land both beautiful and productive.⁸⁰ Twenty years later, however, the situation had changed. In his 1856 report Thomson said that there were plenty of local nurseries, so he supported ending the free distribution of plants and seeds.⁸¹ That was important because it showed that a new attitude to

⁷⁵ Endersby, *Imperial Nature*, 307-9.

⁷⁶ Sivasundaram, ‘Islanded,’ 143.

⁷⁷ *Ibid.*, 197-8.

⁷⁸ British Parliamentary Papers. Report of the Select Committee on the Affairs of the East India Company, Evidence II, 13 Aug 1832 para. 2451.

⁷⁹ BL IOR F/4/1761 no. 72126: Wallich’s 1836 Report on Calcutta Botanic Garden, 13.

⁸⁰ Drayton, *Nature’s Government*, 180-84.

⁸¹ BL IOR F/4/2695 no. 190938: Thomson’s 1856 Report on Calcutta Botanic Garden, 24.

gardening and the opportunities that it provided had taken hold. By the 1860s there were, for example, numerous fern and orchid fanciers in Calcutta.⁸²

There were two other reasons why horticulture was important. Firstly, the horticultural skills involved in creating artificial environments and propagating plants were fundamental to successful crop transfer. Much was achieved with glasshouses in Britain, but they were not very useful in Bengal's hot climate. However, Anderson and King devised other types of plant-house (see Chapter Six), so that by the 1880s a large and impressive range of plants could be displayed and propagated in Calcutta. Improvement of other horticultural techniques, such as grafting and layering, also supported the Garden's work, in acclimatising cinchona, for instance.

Secondly, horticulture was intimately linked with plant collecting and the plant trade, which was an important economic activity during most of the nineteenth century. As David Livingstone puts it, '... an intricate system of plant trade come into being with the intention of harvesting the economic riches of Banks's botanical empire.'⁸³ During his leave in Britain from 1828 to 1832 Wallich came into contact with several aristocratic landowners, and realised how great was the demand for exotic plants for their gardens and estates. At that time, plant transfer was regarded as a virtue, a way of enriching Britain's rather limited flora. Lord Auckland was one of the improving Whig landlords, and a plant enthusiast. When he became Governor General in 1836 he brought out plants for the Botanic Garden, and he took a close interest in its progress.⁸⁴ Wallich was the superintendent who made most use of aristocratic connections, and that was important at the time to ensure support for the Garden, but he also worked closely with a number of commercial nurseries in Britain. However, later officials showed less interest, and Thomson's successors found that highlighting its achievements in horticulture did little to promote the Garden.

In the first half of the nineteenth century the superintendents of the Botanic Garden also played a role in the management of Bengal's forests. Because of the East India Company's concern about timber supplies, several teak plantations had been set up,

⁸² RBG Kew DC 155: Anderson to Joseph Hooker, 4th June 1868; MR 226 Report on Calcutta Botanic Garden, 28th April 1874, para. 2.

⁸³ David Livingstone, *Putting science in its Place*, 55.

⁸⁴ CNH Kolkata Wallich correspondence: Lord Auckland to Wallich, 2nd March 1836.

and in 1820 Wallich was made Superintendent General of Plantations in order to supervise them. His role lasted until 1831, when control was handed back to the districts (see Chapter One). The rich timber resources of southern Burma, partly occupied by the East India Company in 1826, eased concerns about supplies for a while, but anxieties resurfaced more strongly at the end of the 1840s. In Bengal, Falconer was asked to report on the surviving teak plantations. Bombay appointed a conservator of forests in 1847, followed by Madras in 1856.⁸⁵ In the same year, Lord Dalhousie, the Governor General, issued a Memorandum on Forests, stating for the first time the principle that timber standing in them was state property.⁸⁶ By that time a major new demand, for railway construction, was beginning to emerge.

By the end of the 1850s, however, it was clear that the Government needed professional forestry expertise which neither the Botanic Garden, nor anyone else in the Indian Medical Service, could supply.⁸⁷ An Imperial Forest Department was set up in 1864, and a German professional forester, Dietrich Brandis, was appointed Inspector General of Forests in 1866. Unlike most departments it generated a significant income, so grew rapidly. By 1869, there were 57 forest officers and its resources dwarfed those of the Botanic Garden.⁸⁸ By 1889-90 its revenue had reached nearly Rs.1,000,000.⁸⁹

At least until the 1830s, a number of British surgeons hoped that Indian medicinal plants might offer cures unknown to Europeans.⁹⁰ In its early days the Botanic Garden did some work in this field, even though the actual experiments on the remedies were the responsibility of the Apothecary-General. Indeed, in his 1907 letter, classifying the superintendents of the Botanic Garden by their interests, David Prain regarded this as the first of the Garden's functions to have been separated off, writing, 'From 1810 ... the segregation of Materia Medica from scientific botany has been consistent.'⁹¹ He did, however, stress that the Garden had continued to provide

⁸⁵ James Beattie, *Empire and Environmental Anxiety* (London, 2011), Chapter 4.

⁸⁶ *Ibid.*, 106.

⁸⁷ Anderson was in fact appointed Conservator of Forests in Bengal when the Forest Department was set up, but this was a stopgap measure and Anderson gladly handed over the responsibility in 1867.

⁸⁸ Beattie, *Empire and Environmental Anxiety*, 130

⁸⁹ Kumar, *Science and the Raj*, 99.

⁹⁰ Arnold, *Science, Technology and Medicine*, 66.

⁹¹ RBG Kew MR 107: David Prain to Andrew Gage, 8th May 1907, 2.

botanical advice to those who had written on medicinal plants: 'For the botanical basis they have all relied on the officers of the botanical department – Ainslie on Roxburgh, O'Shaughnessy on Wallich and Dutt, and K. L. Dey on King.'⁹²

The Botanic Garden did grow some medicinal plants, such as henbane, for use in the hospitals in Calcutta in the 1830s.⁹³ Wallich also speculated on the possibility of growing South American medicinal plants, such as cinchona and ipecacuanha, in India. That did not happen until the 1860s, and it is worth looking in detail at their introduction as they provide an insight into the difficulties of plant transfer, the level of botanical expertise required, and the way in which it was applied.

Cinchona and other work in economic botany, 1860-1914

For India, cinchona was the major crop transfer in the second half of the nineteenth century. The initiative for transferring tea had come from the Governor General, but the transfer of cinchona was coordinated from London, making it the first British imperial botanical project.⁹⁴ In 1861, when Thomas Anderson succeeded Thomson at the Botanic Garden, the initial batches of cinchona plants were being trialled in the Nilgiri Hills in south India. Anderson was fresh from an attachment to Kew, and very aware of the need for Calcutta to recover its reputation. He was keen to support Kew's effort to demonstrate how economic botany could strengthen the Empire. He therefore argued for experimental plantations in Sikkim as well as the Nilgiri Hills.⁹⁵ He was allowed to go ahead, and the whole exercise in Sikkim was organised by him. After Falconer and Thomson's lack of interest in pursuing economic botany, Anderson introduced a completely different approach, and over the next forty years Calcutta became closely integrated with the global effort coordinated by Kew.

When George King summarised the story of the introduction of cinchona in 1880, he wrote: 'It would be entirely out of place to introduce here a botanical disquisition

⁹² Ibid.

⁹³ BL IOR F/4/1761 no. 72126: Wallich's 1836 Report on Calcutta Botanic Garden, 15.

⁹⁴ Musgrave, Toby & Will, *An Empire of Plants: People and Plants that Changed the World* (London, 2001), 150.

⁹⁵ King, *Manual of Cinchona Cultivation*, 23.

on the perplexing nomenclature of the plants belonging to this genus, ...⁹⁶ He thus highlighted one of the great challenges in dealing with cinchona trees, and the need for botanical expertise to facilitate their transfer. The trees grew in high forests on the eastern slopes of the Andes in South America. Europeans first became aware of the efficacy of their bark as a febrifuge in the seventeenth century. In the early nineteenth century chemists began to separate the alkaloids that gave the bark its anti-malarial properties, and a sulphate of quinine, which made treatment more effective, became available in 1823.

Malaria killed or weakened many European officials and soldiers, so the gradual introduction of quinine compounds would clearly facilitate European rule in the tropics. Surgeons in India recognised the value of quinine, and from the 1820s on, Forbes Royle, Wallich, and a succession of other surgeons proposed growing cinchona in India.⁹⁷ It was not, however, until the mid-nineteenth century that any action was taken. There had been striking demonstrations of the effectiveness of quinine by then: in 1854, when William Baikie led an expedition up the notoriously malarial Rivers Niger and Benue, not a single European life was lost because everyone took a daily dose of quinine.⁹⁸ Pressure therefore grew in Europe to make more cinchona bark available, but the erratic and poorly organised supply chain from South America meant that prices were high: by 1857 the East India Company was spending up to £100,000 a year on importing cinchona bark.⁹⁹ European powers therefore began to plan the transfer of cinchona growing to areas that they controlled.

It was soon realised that the transfer would not be straightforward: the plants grew in remote mountain areas, the South American republics had no reason to collaborate and the genus was botanically perplexing. Working out which species grew where in South America, and which might grow where in South and South East Asia occupied much of the time of European botanists in both regions in the late 1850s and the 1860s. There was a series of officially sponsored cinchona collecting expeditions to

⁹⁶ Ibid., 1.

⁹⁷ Including Falconer, Thomson and Anderson.

⁹⁸ Toyin Falola, & Matthew M. Heaton, *A History of Nigeria* (Cambridge, 2008), 91.

⁹⁹ Mark Honigsbaum, *The Fever Tree Trail: the Hunt for the Cure for Malaria* (Basingstoke, 2001), 96.

the Andes in the late 1850s and early 1860s.¹⁰⁰ Kew played a major role in these efforts, receiving plants and reviving them in a specially built hothouse before despatching them on to India, and later to other British territories. Clements Markham, the India Office official who masterminded the exercise, went himself to South America, and then to India to advise on where growing conditions seemed most to resemble those in the Andes.¹⁰¹

In Markham's view the most promising area was the Nilgiri Hills in south India, and planting started there in 1861. All the species that reached India were tried, and only gradually did it become evident which ones would succeed. The experimental work took place in three other locations apart from the Nilgiri Hills. These were the botanic garden at Peradeniya and Buitenzorg, and in Sikkim. The close international collaboration and exchange of plants between these four sites contributed largely to the ultimate success of the transfer. Whilst he was still on temporary appointment as Superintendent, Anderson went to Buitenzorg to obtain cinchona plants and seeds, and learn about Dutch propagation techniques.

Anderson returned to Calcutta with a supply of cinchona plants to add to those he had brought out from Kew.¹⁰² He had long been interested in the subject, and had written a paper in 1855 on the potential for growing cinchona in India. There were multiple problems to be solved. In hill areas such as Sikkim there is a variety of microclimates and the right one, at the right height, had to be identified, as well as the most suitable soil type. Anderson also had to work immensely hard to overcome the difficulties of setting up plantations on virgin hillsides, and to get the supplies and labour¹⁰³ he needed.¹⁰⁴

The other great challenge was to find out which species of this "perplexing" genus would flourish in Sikkim. The taxonomy of the cinchona plant is very complicated,

¹⁰⁰ See Honigsbaum, *The Fever Tree Trail* for details. Europeans saw the outcome of these expeditions as beneficial crop transfers, but most South American authorities regarded them as unauthorized raids on their natural resources.

¹⁰¹ King, *Manual of Cinchona Cultivation*, 16.

¹⁰² RBG Kew DC 155: Anderson to Joseph Hooker, 13th December 1861.

¹⁰³ Unlike McIvor, the Superintendent in the Nilgiri Hills, Anderson was not supplied with prison labour.

¹⁰⁴ See King, *Manual of Cinchona Cultivation*, 25, for an account of how Anderson overcame these difficulties.

as George King observed. For the purposes of this account there are four main groupings that reached Asia:

- Crown barks, mainly from Colombia and Ecuador (*Cinchona officinalis*, *C. lancifolia* and *C. pitayensis*)
- Yellow barks, mainly from Peru and Bolivia (*Cinchona calisaya* var. *officinalis*, *C. calisaya* var. *vera* and *C. calisaya* var. *ledgeriana*)
- Red barks, from Ecuador and Peru (*Cinchona succirubra*)
- Grey barks, from Ecuador and Peru (*Cinchona micrantha*, *C. peruviana* and *C. nitida*)

Careful testing in Britain had shown that the crown barks and the yellow barks yielded the most quinine. However they were difficult to grow and only flourished in certain conditions. The best of all proved to be *Cinchona calisaya* var. *ledgeriana*. The Dutch were able to get this variety to grow successfully in Java, partly by grafting, and partly by isolating different species once they realised that one of the problems in getting good yields was the tendency of cinchona to hybridise.¹⁰⁵

Seeds of *C. calisaya* var. *ledgeriana* also reached India, but the plant did not flourish there. The only quinine rich species that succeeded in India were the crown bark, *Cinchona officinalis*, which grew successfully in the Nilgiri Hills, and the yellow bark, *C. calisaya* var. *officinalis*, in Sikkim. However both needed a lot of care and did not yield large quantities. The species that really flourished in India was the red bark, *Cinchona succirubra*. It was not rich in quinine, but did contain a number of the other alkaloids, cinchonidine, cinchonine and quinidine. Medical officers in India carried out various investigations in the later 1860s, and concluded that these alkaloids produced a febrifuge almost as effective as quinine.¹⁰⁶

The Sikkim plantations were not properly established until 1865. As the trees then needed to grow, there was little bark available for processing before the 1870s. A specialist quinologist, C. H. Wood, was recruited in 1873. He set up a laboratory in 1874, followed by a basic factory that began production in 1875. The factory processed mainly *C. succirubra*. It extracted the alkaloids and produced a powder

¹⁰⁵ Honigsbaum, *The Fever Tree Trail*, 178.

¹⁰⁶ Report of the Committee of Bengal Medical Officers appointed to examine the Properties of the Cinchona Alkaloids, to the Secretary to the Government of India in the Home Department, quoted in King, *Manual of Cinchona Cultivation*, 52.

based on them. The great advantage of this was that the process was cheap. Quinine cost Rs 6-10 per ounce, but the Sikkim febrifuge was only Rs 1 per ounce.¹⁰⁷ It was used widely in government hospitals, and ultimately put on sale. By the 1890s it was possible to buy a five-grain dose at post offices in Bengal for one pice (the smallest Indian coin, worth about a farthing).¹⁰⁸

Meanwhile, the Dutch in Java gradually cornered the late nineteenth-century world market in quinine. That posed a dilemma for the British, who had gone to an enormous effort to transfer cinchona plants to India. The original aim was to ensure a supply of quinine, which was the prophylactic preferred by the European population and the army. Once it became clear that quinine could not easily be produced in India, however, King changed his approach, and sang the praises of the Sikkim febrifuge: 'The establishment of the therapeutic excellence of these alkaloids ... made much easier of solution the problem of supplying its fever-stricken population with a cheap and effective febrifuge.'¹⁰⁹

The achievement of the India Office, the British plant hunters in South America, Kew, the Medical Service in India and the botanists there was impressive. It is not therefore surprising that they sought other means to justify what they had done when the prize of a steady and reliable supply of quinine eluded them. So the official story was that the transfer had been a success, and that suited the botanists in Britain and in India. It continued to be repeated for many years when an example of the practical benefits of botanic gardens was needed: at the beginning of the twentieth century, Sir Joseph Hooker's godson was reputed to have asked him what commercial transaction had given him the most satisfaction, and to have received the reply, 'Quite certainly the getting of cinchona into India.'¹¹⁰ King summarised the whole exercise in language that was redolent of Robert Kyd's ninety years before, and provides an illuminating example of the continuing British desire to be liked by those whom they governed: 'With a good febrifuge at a rupee or twelve annas an ounce,

¹⁰⁷ King, *Manual of Cinchona Cultivation*, 53.

¹⁰⁸ King, 'A Sketch of the History of Indian Botany', 14; a farthing was one quarter of a British penny, and would be worth around 15 US cents or 10 UK pence in modern terms.

¹⁰⁹ King, *Manual of Cinchona Cultivation*, 53.

¹¹⁰ Ray Desmond, *Sir Joseph Dalton Hooker* (Woodbridge, 1999), 221.

malarious fever should be robbed of three-fourths of its annual victims, and the poor of this land be thus attached to their paternal Government by yet another bond.”¹¹¹

The arrangements for producing cinchona were unusual, with botanists taking on a managerial role.¹¹² When tea was introduced, the plantations and processing facilities were set up by a commercial company, but there was little commercial interest in growing cinchona in India, partly because tea was booming and produced a quicker return.¹¹³ A great deal of prestige had been invested in the cinchona project, however, so the authorities were willing for the Superintendent of the Garden to run the plantations and factory, provided that there was a long-term return.¹¹⁴ George King showed himself able to supervise the complex process successfully, and he produced results. Cinchona growing and processing were therefore accepted as a government enterprise. That clearly had advantages for the Botanic Garden. It had played a very important part in the risky enterprise of introducing cinchona, and it was to the Garden’s advantage to be seen as an institution that contributed to the relief of human suffering in India. King later devised a way of extracting some quinine, and cinchona growing continued to be an important part of the Superintendent’s work up until 1914,¹¹⁵ and beyond.¹¹⁶

The qualified success with cinchona led to hopes that another South American medicinal plant could be grown in India. This was ipecacuanha, an emetic that was regarded as an effective treatment for dysentery at the time. The prolonged attempts to acclimatise it in the 1870s give a good idea of the scientific methods and facilities that the Garden could draw on by the 1870s. Ipecacuanha seedlings were supplied from Kew in 1868, and increased by artificial propagation. Anderson did not think

¹¹¹ King, *Manual of Cinchona Cultivation*, 78.

¹¹² Strictly, King’s role as Superintendent of the Cinchona plantations was separate from his role at the Botanic Garden, but in practice there was much overlap.

¹¹³ Cinchona did for a short while become a commercial crop in Ceylon, but the planters there also turned to tea.

¹¹⁴ The plantations did not start to produce a reasonable economic return until the 1880s.

¹¹⁵ See RBG Kew DC 158: Gage’s letters of 7th November 1906, 27th October 1909 and 28th February 1912 to Prain.

¹¹⁶ The Botanic Garden is no longer responsible for the plantations, which now come under the West Bengal Directorate of Cinchona & Other Medicinal Plants— see wikipedia.org/wiki/Mungpoo (accessed on 30th April 2015).

that there was enough shade and moisture for them to succeed in Bengal, but he hoped that they would grow in the lower hills.¹¹⁷

Plants were therefore sent to Sikkim and careful experimental work by the cinchona plantations staff meant that they were able to produce 63,000 seedlings by 1874.¹¹⁸ However, the planting out was unsuccessful, and in 1875 King wrote 'I am driven reluctantly to the conclusion that it is doubtful whether ipecacuanha can be successfully cultivated as an out-door crop in Sikkim.'¹¹⁹ He did not feel that the exercise had been in vain as cuttings were sent to areas such as Ceylon, southern Burma and the Andaman Islands, with a more truly tropical climate. However, European planters were unwilling to take up the cultivation of ipecacuanha as it was so slow growing. By 1879 it merited only three lines in the Botanic Garden Annual Report, and the experiment was clearly at an end.

At the Botanic Garden, the trees that Anderson planted after the Agri-Horticultural Society gave up its plot in 1867 did not flourish, so King removed them.¹²⁰ As a result, the Garden again had ten hectares of land that could be used for agricultural trials. That was very useful at a time when attitudes to the Garden's role were changing. In much of India there had been an agricultural boom in the early 1860s, based largely on increased cotton exports, to meet Britain's need for an alternative source of cotton during the American Civil War.¹²¹ But after 1865 that short-lived period of agricultural prosperity ended. There were major famines in Orissa in 1866-67, northern and central India in 1868-69, Bihar in 1873-74 and much of central and southern India in 1877.¹²² The British authorities failed to provide adequate relief and millions died. With British confidence shaken, agriculture became an area of greater official concern. The Revenue Department became the Department of Revenue, Agriculture and Commerce, although too few official resources were devoted to agriculture during the next twenty years to have much effect.

¹¹⁷ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1868, 3.

¹¹⁸ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta 1873-74, 4.

¹¹⁹ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta 1874-75, 2.

¹²⁰ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1876-77, 2.

¹²¹ Thompson and Garratt, *Rise and Fulfilment of British Rule*, 481.

¹²² *Ibid.*, 490.

We have already noted (in Chapter Four) how two activist Lieutenant Governors of Bengal, Sir George Campbell (1870-74) and Sir Richard Temple (1874-77) took a close interest in agriculture and directed the efforts of the Botanic Garden towards economic botany. It was becoming clear by that time that the Garden was unlikely to be the means of introducing new famine crops, but the governors still hoped that the introduction of other crops might contribute to agricultural prosperity. Sir George Campbell had set the tone by writing in 1871 that he wanted to see the Botanic Garden used as much as possible ‘for the purpose of introducing plants of practical value, and making horticultural, if not agricultural experiments ...’¹²³ The Garden responded by working on a variety of potential introductions to India. There were two main phases: from 1870 until the middle of the 1880s and from 1890 to 1900.

During the fifteen years from 1872 George King made sure that economic botany was highlighted in his annual reports. King was at that stage already busy with the cinchona plantations, and the attempts to introduce ipecacuanha. Nevertheless, he found time to work on cotton, rice and tobacco, but he quickly concluded that none of those could be improved in Calcutta. In the 1870s the India Office sent the seeds of various other food crops for King to experiment with. However, neither soybeans, nor Mexican wheat, nor Ethiopian teff flourished.¹²⁴ King was candid about this lack of success, but adept at reassuring the government that economic botany continued to be his priority.

Apart from food crops, he focussed on rubber-yielding plants, fibres (mainly for paper) and trees. He had something of a personal commitment to acclimatising rubber, having brought out six *Hevea brasiliensis* plants from Kew when he returned to India in 1873. The plants survived the journey but did not flourish in Calcutta, and it became clear that they would not form the basis for plantations in Bengal.¹²⁵ King did however persist with Ceara (*Manihot glaziovii*), another type of South American rubber plant, though the final result was equally disappointing.¹²⁶

¹²³ West Bengal State Archives, Proceedings General Department, Government of Bengal to Government of India, Agricultural, Revenue and Commerce Department, Sect. 49 para. 3, 12th October 1871.

¹²⁴ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1883-84, 2, and 1887-88, 2.

¹²⁵ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1880-81, 4.

¹²⁶ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1882-83, 3.

The Government of India also encouraged King to experiment with fibres for papermaking, partly to develop a local papermaking industry, but also as a possible export crop. He tried out a large number of plants, including rhea (*Boehmeria nivea*) a plant of the nettle family, Baobab trees, Bamboo shoots,¹²⁷ species of plantain and Japanese mulberry. Finally, King was pleased to report in 1885 that sabai grass (*Eulaliopsis binata*), a species he had recommended, was being used as a raw material at the main paper mill near Calcutta.¹²⁸

The Botanic Garden also had some success with tree introductions. King deployed his accumulated knowledge and experience to consolidate the acclimatisation of the mahogany tree. This had been introduced to the Botanic Garden from tropical America in Roxburgh's time. It grew well in Bengal, and produced good quality timber, but it very rarely set seed. So the imperial botanical network was put in motion, and Kew arranged for a annual supply of seed to reach Calcutta from Jamaica and Honduras.¹²⁹ The Botanic Garden became an important distribution centre. Gradually the number of trees in India increased, and with patient experimentation mahogany did begin to produce seed.¹³⁰ By the end of the nineteenth century it was well established, and has since become an important source of good quality timber in India. A further success was the introduction of yet another South American species, the rain tree (*Albizia saman*). King recognised its potential in the late 1870s and grew many plants in the Botanic Garden, which were freely distributed.¹³¹ It is now highly valued in rural Bengal, especially for its pods, which are fed to cattle.

By the late 1880s, King felt that there was little more that he could achieve in the field of economic botany, and his focus turned to other aspects of the Botanic Garden's work. In his 1888-89 report, with Sir Richard Temple long gone, he devoted only three lines to Economic Plants, and said 'Nothing very special in the

¹²⁷ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1882-83, 4.

¹²⁸ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1884-85, 2.

¹²⁹ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1880-81, 5.

¹³⁰ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1885-86, 2.

¹³¹ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1879-80, 4.

department has engaged attention during the year.¹³² However, the Government's concern about India's agricultural problems had not gone away. The spate of international exhibitions in the 1880s (including Calcutta's own in 1884-85) led to a demand for displays and information on India's agricultural and industrial products. That task was assigned not to the Botanic Garden, but to George Watt, a lecturer in botany, who was given an office in the Imperial Museum.

Edward Buck, the Secretary to the Government of India Revenue and Agriculture Department, found Watt's work so valuable that he asked him to produce a *Dictionary of Economic Products* for the benefit of administrators. Assisted by Babu Trailokhya Nath Mukharji, Watt tackled the job with great vigour and produced a mammoth six-volume account in 1889-90. Watt was then appointed to a newly created post as the Indian Government's Reporter on Economic Products. Two years later, a specialist advisor, Dr J. A. Voelcker, was invited out from Britain to report on Indian agriculture. He called for more technical expertise, and after lengthy consultations the Government decided to appoint an agricultural chemist who would be based in India.¹³³ In another development, the Bengal Engineering College at Sibpur, sited next door to the Botanic Garden, started a course in agriculture in 1897.¹³⁴

In response to this renewed concern about agriculture, the Garden started once more to do work on economic botany. Between 1893 and 1897 it revived the cultivation and distribution of rhea, which, along with sabai grass, was becoming popular as a source for papermaking. It also began to experiment with another American plant, sisal hemp (*Agave sisalana*), which was being distributed by Kew.¹³⁵ In 1895 King's younger and more up-to-date colleague, David Prain, was seconded for several months to report on marijuana growing in India. In the following year, at the request of the Director of Land Records and Agriculture, he conducted experiments at the new Sibpur Experimental Farm¹³⁶ on the races (varieties) of wheat grown in Bengal. During these experiments Prain was able to discover the host of a particularly virulent form of 'rust' that was attacking wheat and barley crops, showing that the

¹³² RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1888-89

¹³³ Kumar, *Science and the Raj*, 97.

¹³⁴ *Ibid.*, 129.

¹³⁵ RBG Kew MR 227: Annual Report of the Royal Botanic Garden, Calcutta, 1891-92, 2.

¹³⁶ RBG Kew MR 227: Annual Report of the Royal Botanic Garden, Calcutta, 1895-96, 2.

Botanic Garden could still perform very valuable services for agriculture in India.¹³⁷ In 1897 Prain followed up his success with surveys of the varieties of mustard grown in Bengal, and then of pulses.

However, the recurrence of famines in the 1890s led to a new British determination to deploy up-to-date scientific skills in agriculture in order to increase productivity, improve yields, process crops more efficiently and deal with pests and diseases. That required the new mycological, bacteriological and bio-chemical skills becoming available in Europe, which a modestly staffed botanic garden could not be expected to offer. The atmosphere of the time is well summed up by the advice given by C. B. Clarke to the young I. H. Burkill:

... for the present it will be good policy on your part to leave the counting of organs of *Ranunculus arvensis* (and such like amusements) to Scotch Professors of Botany, and ply Government with roseate agricultural reports. ... – when you have got to the top, you can indulge in counting organs of *Ranunculus arvensis*, or any other scientific trifling that amuses you.¹³⁸

Kew itself felt this pressure, with Clarke writing in 1905 that the new British Agricultural Board wanted ‘some useful economic work out of the establishment.’¹³⁹

During the time that Curzon was Viceroy, India’s agricultural research capability swiftly improved. The Government took note of the worldwide effort to raise agricultural productivity. By the 1890s, professional agricultural research institutes, such as Rothamsted in England, had shown how crops could be improved by systematically investigating pest control and running long-term experiments on the controlled use of organic and inorganic fertilisers. An Inspector General of Agriculture was appointed for India in 1901. Recognising that natural scientists were starting to understand the role of fungi in plant disease, a post of Imperial Mycologist was created shortly after.¹⁴⁰ That was followed by specialist posts in cryptogamic botany (using funds transferred from the Botanical Survey) and entomology. In 1904 these officers were brought under a Board of Agriculture, and

¹³⁷ RBG Kew MR 227: Annual Report of the Royal Botanic Garden, Calcutta, 1896-97, 2.

¹³⁸ RBG Kew, Burkill Correspondence f.35: C. B. Clarke to I. H. Burkill, 9th December 1902, quoted in Kumar, *Science and the Raj*, 266.

¹³⁹ RBG Kew, Burkill Correspondence f.35: C. B. Clarke to I. H. Burkill, 1905.

¹⁴⁰ Kumar, *Science and the Raj*, 97.

by the time the Indian Agricultural Service was formally set up in 1906 there were forty specialist agricultural posts in the imperial and provincial services.¹⁴¹ In the same year the Indian Agricultural Research Station at Pusa in Bihar became fully functional.

At the Botanic Garden, Prain became superintendent in 1898, and then had less time for agricultural research, although the Garden continued to do some investigative work on indigo and yams. On behalf of the Reporter on Economic Products it also provided a service to determine exactly which species were the source of specific products.¹⁴² However Prain's departure more or less brought to an end the work of the Garden in economic botany. Gage summed up the Garden's changed role in his 1907 Annual Report:

Circumstances have greatly altered since the days when the Calcutta Botanic Garden was the chief place in India for experimental economic work. Now that there are the imperial and the various local agricultural departments there does not appear to be the same necessity as formerly existed for the very restricted staff of the Calcutta Botanic Garden spending time – to the possible neglect of purely botanical research – on work which could be done now under much more satisfactory conditions elsewhere. But because there is now generally speaking no necessity for the Garden to undertake economic experiments, it is not to be implied that it is to cease to take an interest in economic plants.¹⁴³

The Botanic Garden did indeed continue to take an interest, particularly in the matter of exchanges. As Gage went on to note, 'A large field of usefulness still remains in the exchange of seeds and plants of economic importance between India and other countries...', but he was quite correct in saying that it had ceased to have any central role.

Some of the work that had been done on cinchona and ipecacuanha was based on the horticultural skills of the Garden's staff. Horticulture continued to be an important aspect of the Garden's work even after the ending of the free distribution plants in 1857, and the Garden was asked to take responsibility for Calcutta's municipal gardens in 1907. The Garden was still the Government's official nursery,

¹⁴¹ Ibid.

¹⁴² RBG Kew MR 227: Annual Reports of the Royal Botanic Garden, Calcutta, 1898-99, 2, and 1899-1900, 2.

¹⁴³ RBG Kew MR 216: Annual Report of the Royal Botanic Garden, Calcutta, 1906-07, 2.

and went on growing and distributing many ornamental plants and fruit trees that were supplied to soldiers' gardens, prisons, railway stations, governors' residences, and other official institutions.¹⁴⁴ The horticultural abilities needed for propagating specialist plants such as orchids, packing seeds, filling Wardian cases, making sure that they survived sea journeys, and not least, keeping detailed records, continued to be core skills of the whole establishment.

The orchids are a reminder that horticulture was not merely a matter of gardening and display. Important nurseries in Britain, such as Veitch's, could make a lot of money from the introduction of a new variety of rhododendron or orchid.¹⁴⁵ Spreading India's botanical riches to the rest of the world was seen as an important function of the Botanic Garden. In the 1880s and 1890s the Garden maintained orchid collectors in Sikkim, although George King worried about commercial collectors exhausting the stocks.¹⁴⁶ Local people benefitted little from such plundering of India's resources. Orchids were probably the worst example, and other plants that were introduced to Britain involved less exploitation. People in the hills did get something in return, such as improved European fruit trees, potatoes and root crops. But overall, India never quite lived up to the high hopes of horticultural riches that people like Wallich and Lord Auckland had had. It is probably the case that British parks and gardens contain more that was introduced from China and Japan than from India.

Conclusion

Economically India was a disappointment to the British. British rule did little to stimulate economic growth, and India never became as important a market for British goods as had been hoped. The cities expanded, but people in the villages were little better off at the end of the nineteenth century than they had been at the beginning. Despite constituting well over half of the population of the Empire, India had only received 21% of overall imperial investment (and only 10% of Britain's total

¹⁴⁴ See, for instance, RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1880-81, Appendix II.

¹⁴⁵ In 1904 a specialist orchid nursery offered a £1,000 reward for the rediscovery of a particularly desirable but threatened Indian species, *Paphiopedilum furlieanum* (see Desmond, *European Discovery of the Indian Flora*, 326).

¹⁴⁶ Fieldhouse, D. K., *Economics and Empire, 1830-1914* (London, 1984), 55.

overseas investment) as measured in 1914.¹⁴⁷ British rulers had hoped that the work of officially sponsored institutions like the botanic gardens or the Geological Survey might lead to new export crops or mineral discoveries that would stimulate growth and investment. But India was not a newly discovered land: most crops that would flourish there had already been introduced, and most mineral veins had already been investigated.

All the superintendents of the Botanic Garden were aware that they had to conduct some practical experiments, in order to satisfy the Government and get resources for their taxonomic research. However, their level of initiative varied. After the criticisms of the Finance Committee in 1829, Wallich realised that he must counter such complaints, and devoted much of his time and resources to the introduction of tea growing. Wallich did little useful scientific work after 1833, but the successful introduction of tea gave later superintendents an enduring example of the economic contribution that the Garden could make, and they made sure that the officials who controlled the Garden's budget did not forget that. The Garden was alert to subsequent government requests, such as the surveys of timber resources by Falconer in the 1850s and by Kurz in Burma in the 1860s. However that work was basically responsive. In contrast, Anderson used the imperial cinchona project as an opportunity to take the initiative. It is unlikely that cinchona plantations would have flourished in Sikkim without his and King's commitment. Cinchona came to be regarded as another success, even though the British were unable to produce quinine on the same scale as the Dutch.

These achievements relied heavily on utilising the networks that the Garden had built up over the years. In the case of cinchona Anderson was able to work closely with Kew and with Buitenzorg in Java. The introduction of cinchona growing also added significantly to the management charge of the superintendent. As a result the superintendents had less time for their scientific work in Calcutta, although they were able to do some research on plants that only grew in the more temperate climate of Sikkim. Over the years, knowledge of how to manage experimental crops accumulated, and it led to a gradual increase in the Garden's confidence and credibility. In 1840 Wallich had written with some passion about the difficulties of

¹⁴⁷ Robert Johnson, *British Imperialism*, (Basingstoke, 2003), 54.

introducing new plants. In the 1860s a conjunction of factors led to the rapid improvement noted in *The Englishman* in 1869. Anderson was a dynamic superintendent, and employed able curators to support him. They became more skilled at creating the artificial environments many plants needed to survive Calcutta's climatic extremes. By that time too, they had acquired greater expertise in transporting plants.

Even so, success was limited. Surveying the Garden's achievements in his 100th Anniversary history, George King wrote in 1887:

In fact, no small part of the benefits conferred on the country by the garden in its early days was the demonstration by practical experiment that certain natural products, many of them of a most desirable kind, cannot be grown in Bengal.¹⁴⁸

King's conclusion was correct. The economic work of the Garden can best be seen as an intelligence gathering operation, dependent on experiments in the Garden, but also on correspondence with its large network of professional contacts. As Lucile Brockway suggests, 'Botanical knowledge was stored for later retrieval in libraries and herbaria.'¹⁴⁹ A vast amount of information was gathered and sieved. Watt's *Dictionary of Economic Products* was the summary of much of that information, as well as a prospectus for investors.

The difficult and complicated process of plant transfer described in this chapter runs counter to the view that there was an almost mechanistic 'comprehensive system of energy extraction and commodity exchange,' controlled from Kew.¹⁵⁰ As we have seen, botanic gardens could sometimes play a key role, but in other cases, such as indigo and jute, they were only marginally involved. The British and Indian governments were clearly in favour of transferring crops and utilising plentiful Indian labour when there was an opportunity to do so, but it was never a smooth or well-organised process in the Indian context. Even in the case of tea and cinchona there were many mistakes and false starts, and it became clear that effective transfers required a lot of persistence: the success of these projects was due as much to the determination of the planters and workers on the ground as to sustained official

¹⁴⁸ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1886-87, 3.

¹⁴⁹ Brockway, *Science and Colonial Expansion*, 190.

¹⁵⁰ Ibid, 6.

support. Twenty-five years after the Scientific Deputation to Assam in 1835, India was only supplying six per cent of Britain's tea. Similarly, it took some fifteen years from the introduction of cinchona to start producing significant amounts of febrifuge. Continual efforts were also needed to persuade the mahogany tree to set seed in India, and to cultivate rhea successfully as a feedstock for papermaking.

King's comments show the candour with which he was able to conduct his dialogue with officials in India, and with Kew. By being positive about the Garden's successes and open about its failures he had won the respect of the government in India by the 1890s, even though at the same time it was becoming clear that further significant improvements in agriculture would require a greater and more professional input than a botanic garden could provide. Gage was similarly candid in 1907 in defining a new role for the Botanic Garden.¹⁵¹ What had happened was in fact part of a worldwide trend. Agricultural improvement, like forestry, had become a separate specialism, but the transplantation skills, the ability to respond to official suggestions and needs, and the efficient networking, which economic botany had helped the Garden to develop, ensured that it continued to have a role in the twentieth century.

¹⁵¹ RBG Kew MR 216: Annual Report of the Royal Botanic Garden, Calcutta, 1906-07, 2.

Chapter Six

Demonstrating the Garden's purpose: landscape, site management and visitor expectations

This chapter builds on the analysis of space, place and networks in Chapter One, and considers the different ways in which the Garden was conceptualised as a place during the nineteenth century. By looking at how the Garden was managed, and investigating how decisions about its appearance were taken, it will show how the scientific, economic, aesthetic and instructional functions of the Botanic Garden were prioritised at different times to create changing senses of place.

Laying out a garden, in India or anywhere else, can never be a neutral act, and although the superintendents had considerable autonomy, particularly in the early days of the Garden, they were nevertheless subject to a range of pressures. By allocating ground to the Agri-Horticultural Society Wallich, Falconer and Thomson asserted the Garden's interest in economic botany. Griffith and Anderson, in contrast, tried to inscribe science on the landscape, by establishing order beds. By the late nineteenth century however, government views on display became increasingly important, and in response to such changing pressures the superintendents reconfigured Garden as a place where the beauty of plants and the landscape could be admired and understood. The Garden acquired a form that was based not only on metropolitan models of scientific gardens, but also on British landscape and gardening traditions.¹ As will become evident, that outcome was influenced by European interpretations of the tropics, as well as the colonial power structure.

Before a functioning Garden could be created its boundaries had to be secured and the ground prepared for cultivation. That process took nearly a hundred years, and it will be argued that this reflected the difficulties the British had in trying to mould the

¹ Simon Schama, *Landscape and Memory* (London, 1995), 24.

Indian environment and society. As the superintendents attempted to ‘improve’ the site, and carry out building, road making and drainage projects, they faced a range of countervailing forces. As a result it proved very difficult to implement the exemplary management that the British authorities aspired to: India with its cyclones, aggressive animals and opportunistic villagers could never quite be “tamed”. It was, however, very important for the superintendents to show that they were responding effectively to such threats in order to reassure the authorities, and thereby secure the Garden’s funding.

Examining an institution’s design, buildings and landscape is essential to understanding it as a place. The superintendents gradually built on their experience, and became adept at producing garden designs and displays that satisfied and instructed visitors. They tried to make sure that the Garden was conceptualised in the way that they wished in maps, pictures and guidebooks. They also learned to use the public functions and history of the Garden to strengthen their case for resources. The naming of paths and drives, and the use of memorials in the Garden to commemorate distinguished botanists were examples of how they tried to raise the status and prestige of botany. Even the superintendents’ attempts to label their plants showed a desire to create an orderly and instructive environment, although that turned out to be a more difficult exercise than anticipated.

Finally, it is important to note that the landscape of the Garden had to be negotiated with other human participants. The stakeholders included the Government and the citizens of Calcutta, but the neighbours, and the gardeners and labourers who did the actual physical work, also had a stake. They played their part in moulding the Garden, even though they were not formally consulted. Whatever their vision, the superintendents could only accomplish what their staff felt able, or could be induced, to do, as King’s comments on the difficulties of recruiting a reliable labour force in 1894 made clear.²

² RBG Kew MR 227: Annual Report of the Royal Botanic Garden, Calcutta, 1893-94, 1.

Settling the form of the Garden: debates and landscape outcomes

As explained in Chapter One the area enclosed by Robert Kyd when he established the Garden was remarkably large. That had long term cost implications, as a big site was inevitably more expensive to run. For nearly a hundred years successive superintendents struggled with Kyd's legacy, and had difficulty in bringing the whole site into cultivation,³ despite usually having some 150 gardeners and labourers at their disposal.⁴ Kyd had little time to do any landscaping, so it is to Roxburgh that we owe the original appearance of the Garden. He built a three-storey house that became a landmark and an important feature of the Garden. It was on the site of an old Mughal fort, and this new building, with its towers and rounded sides still had something of the appearance of a castle. Certainly its height gave the superintendent a commanding view of the Garden and of the river, and allowed for all round surveillance.



Fig. 18. A mid-twentieth century view of the Superintendent's House from the Garden side (reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew).

³ Even in the 1870s the Superintendent, George King, was complaining that parts of the Garden were uncultivated – see RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1875-76, 2.

⁴ There are few references to the actual numbers of staff employed, but in his report on the Garden dated 17th November 1846 (BL IOR P/13/61) M'Clelland said that the establishment was 132 labourers and 25 chowkidars (guards). If we add the office staff, artists and artisans, then it is probably reasonable to assume that there were usually around 200 people working on the site. Because of its location across the river from Calcutta, most of them lived at the Garden.

The Garden retained its original 310 acres (125 hectares) until 1820. It then suffered its only reduction in size, when the East India Company handed over forty acres of the teak plantation on the eastern edge of the Garden as a site for the new Bishop's College, later the Bengal Engineering College.

Soon after Kyd set up the Garden he put forward the idea that it could be 'a resort for convalescent officers.'⁵ That suggests that he thought of it as something more than a purely economic or scientific institution. Kyd's proposal was never implemented, but the Garden did become an attractive destination for other visitors very early on. It was soon being presented as a place concerned with more than simply experimenting with and classifying plants. Visitors often used the word "beautiful" in their descriptions, thus making Calcutta seem civilised, and a credit to the colonial regime. In 1803, for example, Lord Valentia wrote:

... I visited the Botanic Garden which is under the care of Dr Roxburgh. It affords a wonderful display of the vegetable world infinitely surpassing any thing I have ever before beheld. It is laid out in a very good style and its vast extent renders the confinement of beds totally unnecessary...⁶

During the following thirty years there were similar published comments by Maria Graham in 1810,⁷ Bishop Reginald Heber in 1823,⁸ and Victor Jacquemont in 1829.⁹ The wide circulation of their books put the superintendents under pressure to meet the expectations of subsequent visitors, and provide an attractive, fruitful and natural garden for them.

Even those who did not actually set foot in the Garden would have had expectations. Before the coming of the railways most overseas visitors arrived in Calcutta by sea, and the last part of their journey was along Garden Reach. The impression was often vivid:

⁵ NHM DTC, Vol VI ff.112-114: Kyd's remarks on Banks Report, 25 November 1788.

⁶ Valentia, *Voyages and Travels to India, Ceylon, and the Red Sea*, 39.

⁷ Maria Graham, *Journal of a Residence in India* (Edinburgh, 1812), 145 (entry for 30th November 1810).

⁸ M. A. Laird, (Ed.), *Bishop Heber in Northern India: selections from Heber's Journal* (Cambridge, 1971), 48.

⁹ Jacquemont, *Letters from India*, 14.

No sooner has the Superintendent's House burst on the view of the Calcutta-bound ship, than the word "Garden Reach" is passed fore and aft, and the crew and passengers ... swarm on deck and gaze with delight on the scene.¹⁰



Figure 19. *Garden Reach with the Superintendent's house, with Calcutta in the distance on the opposite bank (hand-coloured aquatint by Robert Howell, after J. B. Fraser, 1824-8, © The British Library Board, no. X644-4).*

But as the Garden developed under Roxburgh's successors, dilemmas gradually emerged. Several of Wallich's correspondents in Calcutta still talked about his beautiful Garden.¹¹ By the 1840s, however, William Griffith was pointing out that parts of the site had become crowded with vegetation.¹² As we have seen, Griffith was a strategic thinker with great energy. He was the first superintendent to articulate an overall vision for the Garden. He noted that part of it was laid out in landscape style, and part in 'an old and obsolete artificial style' and recommended 'The introduction of general uniformity in design and scenic effect', as well as a general thinning of trees.¹³

¹⁰ *The Gardeners' Chronicle*, 14 December 1867, 1265

¹¹ e.g. CNH Kolkata Wallich Correspondence: Letter from D Macleod to Wallich November 1837.

¹² BL IOR P/13/43 nos. 45-46: Griffith, Report on the Hon'ble Company's Botanic Gardens, Calcutta 1843, Section 7: Desirable Changes and Improvements, 4.

¹³ *Ibid.*, 4.

Griffith hoped to separate the scientific from the aesthetic role of the Garden: ‘... the first object I had in view, was its division into a Botanical Garden and a Pleasure Ground. On the former part of which I propose applying the whole strength of the Establishment.’¹⁴ He went on to describe the features he proposed to introduce – reorganised nurseries, natural and Linnaean gardens, a Medical Garden, an Economical Garden, and plantations of fruit trees, jute, hemp and bamboo to meet the Garden’s own needs. Those carefully designed natural and Linnaean gardens were the first attempt to inscribe science on the landscape.

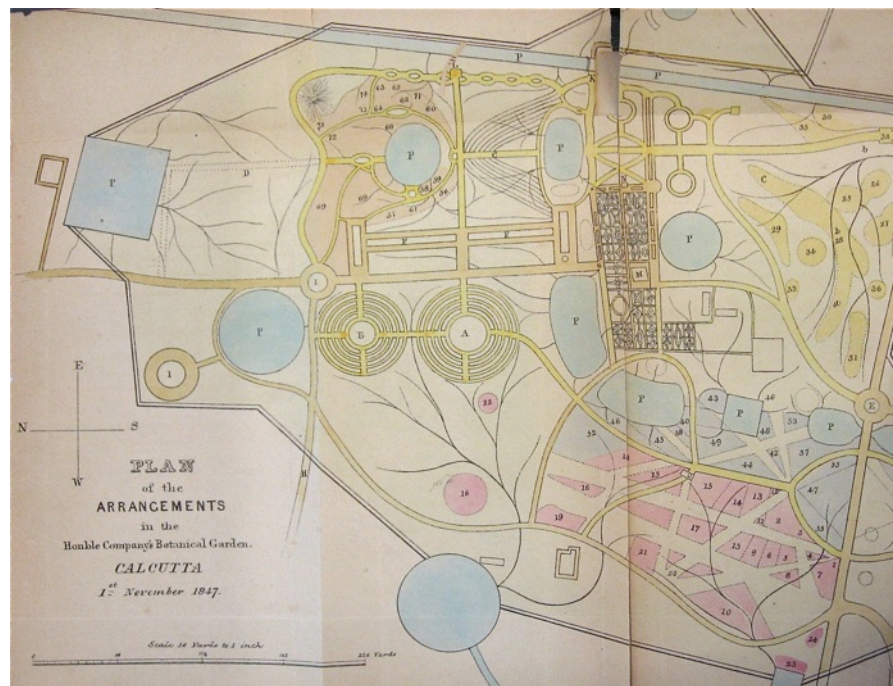


Figure 20. Science inscribed on the landscape: Griffith’s plans for order beds (reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew).

Griffith also set down his ideas on how the Garden should be landscaped. He recommended digging out a large lake,¹⁵ and wrote:

As regards Landscape and Gardening, the changes have been intended to bring out the prominent features of the grounds, to break up the invariable and monotonous confinement of the view ... ; to break up the straight lines in which the trees had been planted.¹⁶

¹⁴ Ibid., 16.

¹⁵ Ibid., 16.

¹⁶ BL IOR P/13/48 nos. 18-23: Griffith, Report on the Hon’ble Company’s Botanic Gardens, Calcutta, 21st June 1844, Section A.

This activist approach reflected a new understanding of the role of scientists and experts. As David Arnold has argued, this was a time when, ‘... India's material environment became increasingly subject to the colonial understanding of landscape and nature, and to the scientific scrutiny of itinerant naturalists...’¹⁷ In submitting his valedictory report Griffith enclosed plans not only of the Botanic Garden as it had been, and as it would appear after his improvements, but also of Wimbledon Park, and of Berlin Botanic Garden.¹⁸ His message was that Calcutta should follow the example of European cities in creating attractive landscapes for their rapidly growing populations.

We know something about how the Garden changed in the early nineteenth century from a set of three maps recently discovered in the British Library by Richard Axelby.¹⁹ The first shows the Garden in 1816 and has various decorative elements, suggesting a rather romanticised concept of the Garden – the figure of a tree and village houses on the outside, and pictures of the bigger trees (including the large banyan tree) within the borders of the Garden.

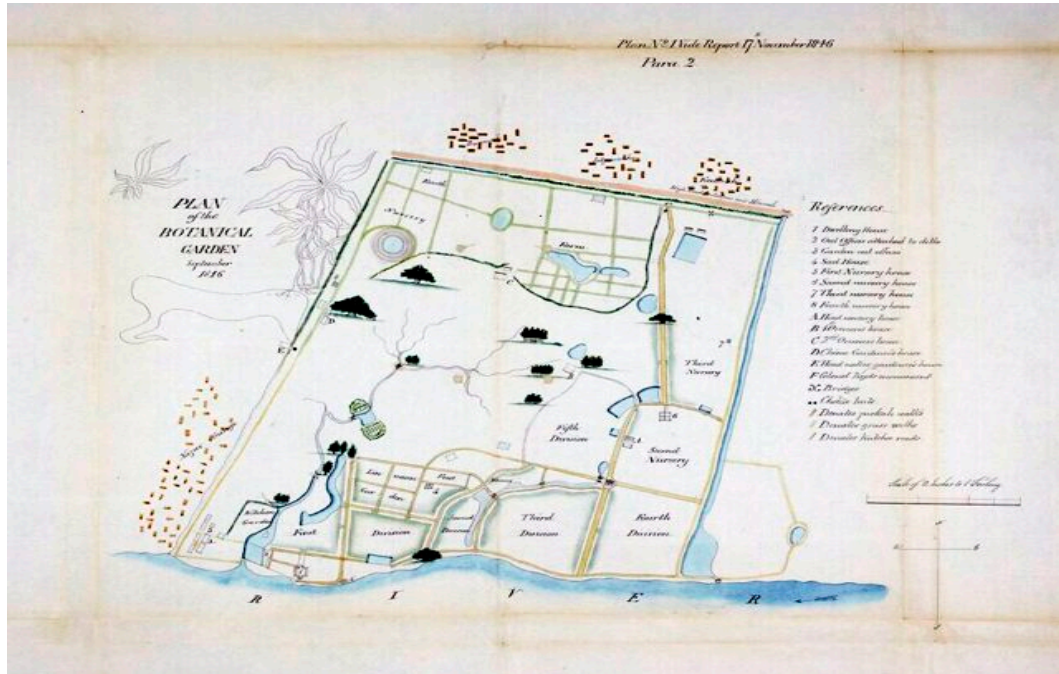


Figure 21. *The development of the Garden: the map of 1816*
(© The British Library Board).

¹⁷ Arnold, *The Tropics and the Travelling Gaze*, 1.

¹⁸ BL IOR P/13/48 nos. 18-23: Covering letter to Griffith's Report on the Gardens, 21st June 1844.

¹⁹ Axelby, (2008) 'Calcutta Botanic Garden and the colonial re-ordering,' 150-63.

The second map is dated 1845. It is less fanciful than the 1816 one, but is coloured and has carefully painted rows of trees. It shows that a good deal of work had gone on during Wallich's superintendence to bring uncultivated parts of the Garden into use. Wallich also extended the network of paths, and some of those that still exist today are clearly shown.



Figure 22. 1845 map prepared by Griffith, showing how order was gradually being imposed in the early 1840s (© The British Library Board).

The plan dated 1846 reveals many changes. Here, as Richard Axelby suggests, there is a new scientific vision of a botanic garden, with everything carefully ordered and efficiently run, as Griffith tries to reflect a new resolve by the East India Company to “improve” and develop India.²⁰ After the 1840s, representations of the Garden appeared regularly. It was shown prominently on maps of the Calcutta area (see Introductory Note), and guidebooks to Calcutta usually devoted a page or two to the Botanic Garden.²¹

²⁰ Ibid.

²¹ See for example, W. Newman, *Handbook to Calcutta, historical and descriptive* (Calcutta, 1892).

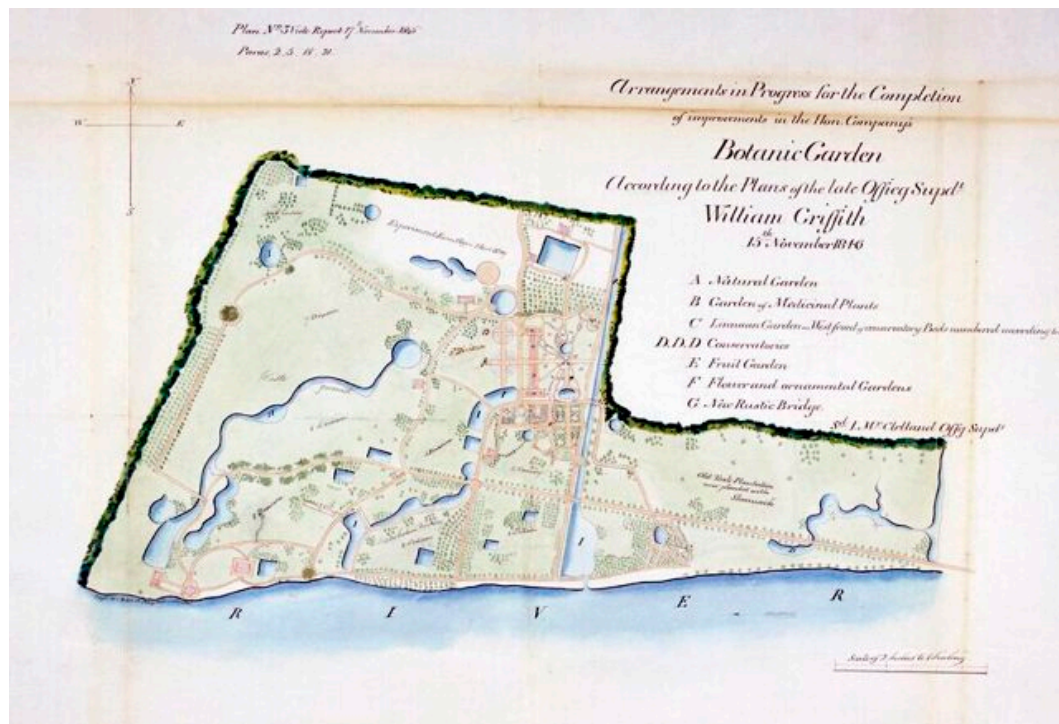


Figure 23. The development of the Garden: the 1846 map (© The British Library Board).

When M'Clelland acted as superintendent between 1846 and 1848 he carried on Griffith's work. Reporting at the end of 1846 he said that the new layout 'will preserve the distinction between science and mere ornament, while it equally preserves and combines, as it were, the interest of both.'²² Something went wrong, however, and it seems that Griffith and M'Clelland were less talented as nurserymen than they were as thinkers and planners. Shortly after, Joseph Hooker was certainly unimpressed:

In 1847²³, when I first visited the establishment, nothing was to be seen of its former beauty and grandeur, but a few noble trees or graceful palms rearing their heads over a low ragged jungle, or spreading their broad leaves or naked limbs over the forlorn hope of a botanical garden, that consisted of open clay beds, disposed in concentric circles, and baking into brick under the fervid heat of a Bengal sun.²⁴

By the time that Hooker returned to Calcutta in 1850, after his travels in Sikkim, Falconer had taken over as superintendent and Hooker looked on the Garden much more favourably. His description was rich in aesthetic language:

²² BL IOR P/13/61 M'Clelland's Report on Calcutta Botanic Garden, 17th November 1846.

²³ This must be a mistake, as Hooker did not arrive in Calcutta until January 1848.

²⁴ Hooker, *Himalayan Journals*, i, 252

The grounds bore a park-like appearance, broad shady walks had replaced the narrow winding paths ... a large Palmetum, or collection of tall and graceful palms ... occupied several acres... whilst a still larger portion of ground was being appropriated to a picturesque assemblage ... whose association promised to form a novel and attractive study to the botanist, painter and landscape gardener.²⁵

Hooker vividly demonstrates how impressions of a place can be transformed over a period of two years. He thought that the prime function of a botanic garden was scientific, but his comments make it clear that he believed very strongly that the garden should also be aesthetically satisfying. The mistake of Griffith and M'Clelland was to try to separate the aesthetic from the scientific role of the Garden. Hooker's book sold widely and his fulminations would have been well known to many officials. After Falconer took over in 1848 it was clear to all superintendents that they must take into account the views of Kew, and find ways of integrating the functions of the Garden, rather than simply dividing it into 'a Botanical Garden and a Pleasure Ground.' As Hooker noted, the work of Falconer, and his successor, Thomson, helped the garden to recover some of its former attractiveness. After Falconer's planting of the palmetum and other trees, Thomson wrote, 'On the whole I think that the Garden is in very good order ... there are so many elegant flowering trees.'²⁶ Thomson did some more tree planting, and laid out new roads in the northeast part of the Garden near the palmetum, but he did not work to any overall plan.

Landscaping was not the only challenge. We know from his correspondence that Wallich was often anxious about the security of the site. He made numerous references to 'thieving villagers' and dishonest guards, and he referred more than one case to the Magistrate in Howrah.²⁷ Griffith was similarly worried: in his 1843 Report the first of his sixteen desirable improvements is, 'The formation of a proper fence round the land boundaries of the Garden. At present it is accessible from all quarters, and is consequently liable to suffer from depredations.'²⁸

²⁵ Ibid.

²⁶ RBG Kew DC 55: Thomas Thomson to Sir William Hooker, 18th May 1855.

²⁷ CNH Kolkata Wallich Correspondence: Letter of 1st February 1834 to Howrah Magistrate.

²⁸ BL IOR P/13/43 nos. 45-46: Griffith, Report on the Hon'ble Company's Botanic Gardens, Calcutta 1843, Section 7: Desirable Changes and Improvements, 1.

At this time, the need to bring the whole Garden into cultivation was also emerging as an issue. McClelland, expressed concern in 1846 that a quarter of it was still ‘waste ground’.²⁹ The situation had not improved much when Thomson reached Calcutta in 1855. He sent his initial impressions of the Garden to Sir William Hooker a month after his arrival, and said that, ‘a considerable portion is in a semi-savage state, covered with coarse grass...’³⁰ These are the first specific references to the uncultivated areas of the Garden, and coincided with Dalhousie’s “improving” policies and his expectation that directly controlled British space needed to be a model of good management. At the same time botanic gardens worldwide were becoming bigger, and Kew, whose area expanded rapidly after 1845, was setting new standards of planning and control.



Fig 24. One of the earliest photos: Calcutta Botanic Garden in the 1850s. In the later part of the nineteenth century photography gradually became a significant means of communicating an image of the Garden as an ordered tropical environment. (© The British Library Board, no. 247116).

With the demise of the East India Company in 1858 the Garden was renamed the Royal Botanic Garden. Thomas Anderson’s arrival as superintendent, shortly after, marked a turning point. He was not impressed by the tentative efforts of his immediate predecessors: ‘I still abuse Falconer and Thomson for doing so little good

²⁹ BL IOR P/13/61: Report by McClelland, 17th November 1846, 20.

³⁰ RBG Kew DC 55: Thomson to Sir William Hooker, 18th May 1855.

work ... The plants are scattered over the Garden without any order, new plants being put in the ground where ever a place could be found.³¹ Like Griffith, Anderson was a man of energy and vision, and he thought carefully about how the Garden should develop. In his annual report in 1862 he summarised what had been done during the first seventy-five years (1786-1861), and put forward a plan for future landscaping. He believed that the early superintendents had simply placed trees where they would look most striking when fully grown. As a result: 'The indiscriminate planting which has been going on ever since the formation of the Gardens has now ended in great confusion and overcrowding, while the usefulness of the Gardens as a scientific establishment has been greatly affected.'³²

The particular scientific difficulty lay in comparing species within a genus when they might have been planted a mile away from each other. Anderson referred to Griffith's attempts to solve the problem by felling most of the trees in the Garden and starting anew, but was well aware that that approach had been discredited and would not be acceptable on aesthetic grounds. He noted that Falconer had already demonstrated the advantage of scientific grouping by introducing a palmetum. Otherwise:

The want of any arrangement, however, in the other parts of the Garden has now reached such a point that it is almost impossible to carry on the work of planting out the annual additions to the species in cultivation, and whatever is planted adds only to the confusion already existing.³³

Building on his knowledge of the gardens at Buitenzorg in Java, and working closely with Robert Scott, the Garden Curator, Anderson mapped the Garden and devised a flexible plan for planting: 'The method of arrangement followed was that adopted in my printed Catalogue of the plants of the Botanic Gardens, but that system was not rigidly followed when any peculiarity in the landscape required a departure from it.'³⁴ He stressed that: 'No large or fine trees have been cut down, but those occurring on the ground have been taken advantage of in the general arrangement, some of them serving as specimens of the arrangement, while others form good objects in the

³¹ RBG Kew DC 155: Thomas Anderson to Joseph Hooker, 8th September 1861.

³² RBG Kew MR 226: Report on the Condition of the Royal Botanic Gardens, Calcutta, 1861-62, 1.

³³ *Ibid.*, 2

³⁴ *Ibid.*, 2

view.³⁵ In other words, he believed that he could make the space more attractive at the same time as improving the scientific arrangement: good aesthetics and scientific planning could co-exist.

Anderson was also the first superintendent to introduce artificial environments. Writing about Calcutta Botanic Garden in 1846, Royle had said ‘There is not a glasshouse or conservatory in the whole establishment.’³⁶ He explained that the Garden ‘does not possess a single means of producing an artificial climate, or of equalising temperature to suit different plants’, and contrasted that with the fact that ‘for the Royal Garden at Kew £30,000 sterling have been applied to the construction of a single palm house.’³⁷ After 1829 the East India Company had run Calcutta Botanic Garden on a reduced budget, but in the 1860s the new Government of India was impressed enough by Anderson’s confident planning to allow some special grants. He was therefore able to put up the first specialist buildings, a small glass conservatory for ferns and a pan shed used as an orchid house.³⁸

However, much of his work was undone by the cyclones that struck the Garden in 1864 and 1867. The Garden was flooded with brackish water and lost over half of its trees. These cyclones were a reminder that no landscape is entirely secure, in India or anywhere else. They did very serious damage, but they also resulted in changed perceptions about the Garden’s fertility. As we have seen, the British were impressed by India’s tropical beauty and fruitfulness, but anxious about the climatic extremes and the rapid spread of disease.³⁹ For several years the colonial dialogue about the riverine site became one of disease and stagnation rather than tropical fecundity.

The British press echoed these ambivalent attitudes. Writing about the cyclones, the *Gardeners’ Chronicle* (which often reflected the views of the Hookers) said:

³⁵ Ibid., 2

³⁶ RBG Kew MR 225: Royle’s 1846 Memorial on Calcutta Botanic Garden, 5.

³⁷ Ibid.

³⁸ RBG Kew MR 226: Report on the Condition of the Royal Botanical Gardens, Calcutta, 1867-68.

³⁹ Arnold, *The Tropics and the Travelling Gaze*, 226-7.

Garden Reach is on a beautiful bend of the River Hooghly ... It embraces a level expanse of muddy soil ... occupied by the Botanic Gardens. Nothing of this kind can exceed in beauty and verdure this river reach, which greets voyagers as their vessel steers up the broad breast of the river.⁴⁰

But it went on to say that the beauty of its position was its only real advantage, and then pointed out the drawbacks – the poor soil, tidal scouring, the unhealthiness of the site and its lack of protection from cyclones. Anticipating the reader's response it stated:

Much of this will no doubt surprise the English reader, who is apt to regard all tropical climates as suitable for tropical trees and fruits, and all tropical countries as groaning under a superabundant vegetation; but the fact is that Lower Bengal ... is singularly devoid of the noble characteristics of a tropical vegetation ...⁴¹

Anderson had little chance to reconstruct the Garden as he was invalided back to Britain in 1869 and died less than two years later. That contributed to a crisis of confidence, and a series of suggestions that the Garden should be moved. A leading Calcutta newspaper started by praising the improvements introduced by Anderson:

It is worth all the trouble of a five miles drive, and the discomfort attendant on crossing the river in a dinghy just to see the new Fern house ... Temperate plants are now grown in grass Betel houses ... Visitors to the Garden should not omit to see the Orchid House ... The glass conservatory contains some very delicate and graceful exotics ...⁴²

But the article went on to suggest that the Garden be moved across the river to Calcutta, or even to the foothills of the Himalaya, so that all these attractions would be protected from future cyclones, and available to many more people.

A couple of years later, in 1871, Joseph Hooker, by then the Director of Kew Gardens and Britain's leading botanist, expressed his lack of faith in the Garden. The Lieutenant Governor was also disparaging (see Chapter Four). Henderson, the acting Superintendent in 1872-73, confirmed that although Anderson had had grand ideas, his natural order beds were in poor condition, and the trees he had introduced were not thriving because they were planted in the open.⁴³ In spite of his careful planning,

⁴⁰ *Gardeners' Chronicle*, 14th December 1867, p.1265.

⁴¹ *ibid.*

⁴² *The Englishman* (Calcutta), 9 January 1869, Editorial.

⁴³ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1872-73, 4.

Anderson had in fact fallen into the same trap as Griffith: he had attempted to inscribe science on the landscape, and thereby made the Garden less attractive. The Lieutenant Governor's resultant disapproval was a threat to the Garden's future support.

When he finally settled in as Superintendent, George King refused to be cowed by this unpromising situation. He understood the importance of landscaping, and in his 1874 Annual Report, he wrote: 'With a little money a great deal could be done in the way of landscape gardening.'⁴⁴ King had spent some time at Kew whilst he was on sick leave in 1872-73. That no doubt gave him ideas about how a botanic garden should look, and he turned out to have a very good eye.⁴⁵ He (and many others in the growing network of botanic gardens) would also have drawn a lesson from dismissal in 1873 of Baron von Mueller, the Director of Melbourne Botanic Garden. Von Mueller was an outstanding botanist who focussed on acclimatisation and research, rather than maintaining his Garden, which became an overgrown tangle of trees. The popular demand for something more pleasing was so great that he was relieved of that side of his responsibilities:⁴⁶ 'The von Mueller case (1873) was an object lesson to every imperial curator that no matter how assiduous one might be, if one did not provide an attractive garden one's days were numbered.'⁴⁷

⁴⁴ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1873-74, 2.

⁴⁵ This was recognized by the Government of Bengal, which also employed him in 1875 to lay out the grounds of the new Zoological Gardens in Alipore, a suburb of Calcutta, and later the Lieutenant Governor's residence in Darjeeling – see RBG Kew MR 226: Resolution: Financial Department – Agriculture, Calcutta, 10th July 1876, attached to CBG Annual Report for 1875-76, para. 9.

⁴⁶ Katie Holmes, Susan Martin & Kylie Mirmohamadi, *Reading the Garden: The Settlement of Australia* (Melbourne, 2008), 69. Mueller did however remain as Government Botanist in Victoria, and continued to do scientific work on the Australian flora until his death in 1896.

⁴⁷ McCracken, *Gardens of Empire*, 32.

King built on Anderson's initiative and ultimately excavated a series of interconnected lakes. As a result of the cyclones the 270 acres that King inherited were in poor condition, and, in the view of Hooker, of doubtful fertility.⁴⁸ Much of the Garden, far from being an exemplar of careful and efficient European management, was unattractive and overrun with weeds.⁴⁹ It had been shown to be vulnerable to cyclones, river erosion and encroachment. However, once it was clear that the Government would not provide the resources for a wholesale move, King, displaying remarkable confidence for a young surgeon, set about organising the Garden's recovery. He aimed to restore its fertility where he could and grow appropriate plants in the less fertile areas. Even so, it was a slow process developing the west part of the Garden. In 1876 King admitted, 'As a matter of fact, this (west) part of the garden has never been properly laid out.'⁵⁰

King was perhaps fortunate that in 1874 Sir George Campbell was replaced as Lieutenant Governor by the more supportive Sir Richard Temple. By this time, display was beginning to be seen as a way of validating British rule. In 1877 King reported that Rs.10,500 had been spent on the east part of Garden. He believed that if the level could be raised 'It would then be possible to lay it out, as a kind of park, with groups of useful and ornamental trees and intervening open glades of grass.'⁵¹ He went on to say: 'Through the liberality of Government in giving special grants of money during the past and previous years, more has been done for the permanent improvement of the garden than during any twenty years since its establishment.'⁵² King proved to be very effective in using arguments for landscape improvements as a way of getting more resources from the government. Perhaps influenced by Kew, his policy was to suggest a modest programme of improvement in one area of the Garden each year.⁵³ His success in making the Garden more attractive as he spent each tranche of money meant that further grants were usually forthcoming, particularly whilst Sir Richard Temple was in charge.

⁴⁸ RBG Kew DC 156: Draft letter from Joseph Hooker to King, 1871?

⁴⁹ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1873-74, 2.

⁵⁰ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1875-76, 2.

⁵¹ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1875-76, 2.

⁵² Ibid.

⁵³ Joseph Hooker told Thomas Anderson that his father had followed such a policy: see Huxley, *Life and Letters of Sir J. D. Hooker*, ii, 10.

One of King's innovations was to use the spoil from the lakes he excavated to vary the contours by making mounds and hillocks. King's approach was innovatory in India and based on classic English landscaping principles. That was in contrast not only to the more formal continental European approach, but also to the classic symmetric Persian *chahar bagh* garden on which the Mughal gardens of India were based. He created serpentine lakes, and aimed to use curves and groups of trees to create a natural look, although he did retain a few of the old formal avenues. The result was a Garden that became more attractive to visitors. But his work also favoured the Garden by conveying a subtle message to officials. He made it seem that the colonial régime could improve the landscape of Bengal, and show how its supposedly disappointing tropicality could be managed and made more beautiful.



Fig. 25. Lake in the Botanic Garden showing the effects of King's landscaping, still evident in 2013.

As King thought through the aims of his landscaping, he realised that he must address the issue of planting according to scientific order, which had exercised Anderson so much:

Soon after taking charge of this garden, six years ago, the opinion began to be forced upon me that the scheme of planting out the garden on a formal systematic arrangement was a mistake ... Even had the trees and shrubs so planted thriven well, the result would have been a successful plantation, but not a garden. Landscape effects are impossible where trees stand at regular intervals.⁵⁴

⁵⁴ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1876-77, 2.

This was a major departure from his predecessors' policies. Henceforth, aesthetic impressions and visitors' satisfaction were given priority, and attempts to inscribe science on the landscape were finally abandoned.

Scientific work was not necessarily downgraded, but it was largely transferred to the new herbarium that King designed and built, and to the nurseries. The herbarium was of key importance for him. In his report for 1882-83 King wrote enthusiastically:

Since my last report the new building for the Herbarium has been completed ... The old building in which the collections were previously accommodated (in addition to its other faults) was hopelessly small, and in it the collections were so crowded that it was difficult to consult them... In the new building there is ample space...⁵⁵

The building followed best practice in being modelled on a recent extension to the Kew herbarium, and the argument that India should have a comparable institution had traction with officials in India. So although King did not create scientific space outside, he did create a major interior space, which was carefully managed with restricted access. David Livingstone encourages us to look carefully at such sites of knowledge generation, suggesting that: 'Attending to the microgeography of the lab ... takes us a long way towards appreciating that matters of space are fundamentally involved at every stage in the acquisition of scientific knowledge.'⁵⁶

⁵⁵ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1882-83, 6.

⁵⁶ D. Livingstone, *Putting Science in its Place*, 12.



Figure 26. A contemporary photograph of the herbarium, completed in 1883 (courtesy Central National Herbarium, Kolkata).

In his other building work King built on Anderson's efforts to create artificial environments to enable alien and unusual plants to flourish in Calcutta. He came up with an economical solution by using cast iron structures with a thin thatch on wire netting. He was thus able to build quite large and ingenious plant houses⁵⁷ based on local models. They enabled the Garden to replicate forest conditions and to have 'a show of Orchids that attracted all European Calcutta,' according to an article in the *Gardeners Chronicle*.⁵⁸

King also addressed the unresolved issues of order and security. In 1880 he wrote, 'When all the additional work of laying out has been finished, it will be easy to keep the whole in a state of order and efficiency.'⁵⁹ "Order" and "efficiency" were watchwords for the late nineteenth-century colonial administration and King knew that his superiors would agree that the Garden should be an exemplar of these British virtues.⁶⁰ But not all went his way. For twenty years King struggled to establish firm boundaries to prevent encroachment by the river and by neighbouring

⁵⁷ RBG Kew MR 226: Annual Reports of the Royal Botanic Garden, Calcutta, 1876-77, 2 and 1888-89, 1

⁵⁸ *Gardeners' Chronicle*, 280, 3rd Mar 1883.

⁵⁹ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1879-80, 1.

⁶⁰ Metcalf, *Aftermath of Revolt*, 3.

villagers. In 1881, he reported that he was digging canals and said: "These canals form excellent barriers against stray cattle and thieving villagers."⁶¹ A boundary wall and ditch followed in 1882.

That still left the problem of the erosion of the riverbanks, caused particularly by steam tugs ignoring the regulations and creating too much wash.⁶² Piling was put in and a brick wall built to deal with this, but then there was a recurrence of problems with neighbours. In 1887 King reported that there had been five attempts at encroachment on the landward side, and in 1888 he called again for a wall or stout fence. Only after twenty years of effort did King feel that he had succeeded. In 1891 he wrote:

The Department of Public Works having during the year completed the wire fence along the whole of the garden boundary not previously defined by a wall, the encroachments of unscrupulous outside cultivators and others have, it is to be hoped, been put an end to forever.⁶³

King's efforts meant that, after a hundred years, the Garden had finally achieved a degree of security. However, the struggle to maintain the riverbanks continued, and as if to stress that India's unruly environment would never allow complete control of the Garden, there was an earthquake in 1897. The Superintendent's house was badly damaged, as was the Herbarium.

King was the main creator of the landscape as it is now. He worked closely with his garden curators and with the Government, but most of the landscaping initiatives came from him. The Government had not articulated its ideas clearly, but King had judged correctly what would be acceptable to them. Meeting official expectations meant that he was able to attract new resources, and he finally found solutions to many of the problems that had taxed his predecessors:

The swamps, converted into pools, formed ideal settings for the gigantic South American water-lily... and the monotonous flatness of the landscape was relieved by hillocks. Abhorring the precision of formal planting, he massed trees and shrubs with a deliberate disregard for taxonomic relationships.⁶⁴

⁶¹ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1880-81, 1.

⁶² RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1873-74.

⁶³ RBG Kew MR 227: Annual Report of the Royal Botanic Gardens, Calcutta, 1890-91, 1.

⁶⁴ Desmond, *European Discovery of the Indian Flora*, 101.

King's landscaping succeeded not only in remoulding the Garden but also in changing perceptions of it. The claims from the late 1860s that it was infertile and unhealthy faded, and during the 1870s and 1880s attitudes became more positive. The Government Resolution on King's 1895 Report summed up its satisfaction with '... the garden, which has now for a number of years been a most popular resort ...', and praised his achievement:

Dr King's singular talent for landscape gardening has enabled him, during the 24 years he has been in charge, to add greatly to the beauty of the garden by skilful grouping of trees and shrubs, and it now ranks high among similar institutions for picturesque scenery no less than for scientific completeness.⁶⁵

King's successors did not make much change to his plan, but Gage did introduce two refinements. One was to create vistas by clearing trees along selected sight lines. The other was to make certain areas of the Garden representative of the vegetation of different parts of India, and of the rest of the world. Gage wrote that: 'It is intended that these divisions should in the future, as opportunity permits, gradually become representative of the countries mentioned.'⁶⁶ That was a sort of imperial conceit, an attempt to suggest that the whole world could be encapsulated in one space, but the scheme was implemented in a piecemeal way, and is now difficult to discern.

Labelling

The aim of parks is chiefly to provide open space for relaxation and exercise. But botanic gardens define themselves by providing facilities for education, research and experimentation as well. And if any aspiring botanist, or staff member, is going to learn names and recognise relationships between plants, then they must be labelled. Labelling thus distinguishes botanic gardens, and was an important part of the effort to impose structured meaning in the Calcutta Garden:

Hence botanic gardens, with their avowedly scientific purpose ... labelled their trees and plants, so that the visitor, invigorated by the air, refreshed by the sight of the gardens, edified by their beauty or awed by their size, could also gain useful

⁶⁵ RBG Kew MR 227: Government Resolution on Calcutta Botanic Garden Annual Report 1894-95.

⁶⁶ RBG Kew MR 216: Annual Report of the Royal Botanic Garden, Calcutta, 1911-12, 1.

information from them, and perhaps be moved to emulation.⁶⁷

Labelling may seem a minor issue, but it does demonstrate the need to give careful attention to botanical practice.⁶⁸ It was particularly important in colonial situations. Labelling plants was a way of pinning them down, and showing how they fitted into the larger scheme of European scientific botany. It was a way of conquering and capturing an alien flora and of consolidating power over the environment.

The story in Calcutta shows just how difficult labelling is. As with so much else, Griffith was the first to highlight the issue, writing, 'At present the few plants that are ticketed are named in Bengallee, only intelligible, as I have ascertained ... to the Malee (*gardener*) who wrote them.'⁶⁹ A few years later, M'Clelland complained that Wallich's labels were either bamboo or lead, neither of which lasted. M'Clelland planned to use printed ones protected by mica.⁷⁰ Anderson returned anew to the task and wrote 'The naming and labelling of the trees advances steadily & is appreciated by the public.'⁷¹ Writing to Joseph Hooker a year later Anderson mentioned the trees planted by Roxburgh and said 'I have them ticketed with zinc labels at once, just as your arboretum is done.'⁷² That was still not adequate. In 1870 Clarke wrote:

The rain and sun of Bengal have been found alike destructive to the paint employed on the name labels attached to plants, and from this cause it has hitherto been found impracticable to keep more than a limited number of the plants ... legibly named. The plan of stamping the names on the metal has been commenced.⁷³

Even stamping the names had its drawbacks though, and Henderson was not satisfied with Clarke's system. He planned another new approach:

Every description of label seems to have been tried, but I do not think that a satisfactory one has yet been discovered. Stamped zinc labels are permanent, but

⁶⁷ Holmes, Martin & Mirmohamadi, *Reading the Garden*, 59.

⁶⁸ Endersby, *Imperial Nature*, 6-7.

⁶⁹ BL IOR F/4/2128 no. 100275: Griffith's Report on the Botanic Garden, 1843, Section 7: Desirable Changes and Improvements, para.8.

⁷⁰ BL IOR P/13/61: Report by M'Clelland, 17th November 1846.

⁷¹ RBG Kew DC 155: Anderson to Joseph Hooker, 8th June 1861.

⁷² RBG Kew DC 155: Anderson to Joseph Hooker, 23rd November 1862.

⁷³ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1869-70, 8.

illegible; ... I now propose to try printed labels pasted on the trees and pasted over with some waterproof varnish.⁷⁴

King is the one superintendent who does not mention labelling plants. Gage, however, showed that this perennial problem persisted into the twentieth century: in 1909 he reported that: 'A beginning has been made with the substitution of imperishable labels with raised lettering for the present painted zinc plant-labels, which readily become illegible after exposure to the weather and require constant repainting.'⁷⁵



Figure 27. An example of the labels being used at the Botanic Garden in 2013.

These British superintendents were all capable botanists who wanted to spread knowledge of their subject. They understood how important labels were, and knew that government officials would regard clear labelling as evidence of a well-run institution. In practice however, it was very difficult to find a suitable label for Indian conditions, and their dream of exemplary management was often frustrated, as it was in so many other circumstances in India.

⁷⁴ RBG Kew MR 226: Annual Report of the Royal Botanical Gardens, Calcutta, 1872-73, 16.

⁷⁵ RBG Kew MR 216: Annual Report of the Royal Botanic Gardens, Calcutta, 1908-09, 1.

Responding to visitors: creating a site for instructive and healthy relaxation

*Public parks and gardens, such as this, are universally recognised as powerful agencies for refining and civilising the masses of the people, and as a most efficient means of putting a pure and elevating kind of pleasure within their reach.*⁷⁶

The Garden received visitors from the beginning, so there needed to be some means of interpreting it to them. For the first fifty years or so the main interpreter was the superintendent, and we have accounts of both Roxburgh and Wallich escorting their visitors around the Garden.⁷⁷ Access was not easy. The Hooghly is a wide river with a strong tide. The Garden is on the opposite side to Calcutta, and there was no bridge until 1874. Most Europeans lived near the centre of Calcutta, four or five miles from the Garden, and many Indians lived even further away. Rich people might have their own boats and rowers, but any other visitor would either have to hire a boat for several hours, or have a long walk or drive to a point opposite the Garden to catch a ferry.

Whilst the written accounts come from the European élite, many others went to see the Garden, or to collect the plants and seeds that were distributed at no more than a token price. In 1836 Wallich wrote that, ‘People of all nations and ranks, both European and natives, resort to it and are freely admitted....’ The garden is accordingly much frequented at all times of the year, esp on holidays.⁷⁸ In Britain, by this time, the early Victorians were beginning to lay out public parks. Rapid industrial expansion meant that many towns had become heavily polluted. Working class inhabitants often had little access to gardens and fresh air, and there were anxieties about their behaviour. It was thought that parks could play a “sanitary” role, and provide space for healthy exercise and the appreciation of natural beauty. The desiderata and purpose are well summed up in this comment on a new park in Derby:

... planted with a great variety of trees, shrubs and flowers, botanically arranged. The Arboretum, as these gardens are designated, is much frequented, and has

⁷⁶ RBG Kew MR 226: Annual Report of the Royal Botanic Gardens, Calcutta, 1883-84, 2.

⁷⁷ See for example Graham, *Journal of a Residence in India*, entry for 30 Nov 1810 and Laird, (Ed.), *Bishop Heber in Northern India*, entry for 20 Nov 1823.

⁷⁸ BL IOR F/4/1761 No. 72126, Wallich: Report on Calcutta Botanic Garden, 1 Oct 1836, 21.

already produced a perceptible effect in improving the appearance and demeanour of the working class.⁷⁹

In the middle of the nineteenth century the government in India regarded crop transfer as a more important purpose for the Botanic Garden than giving the urban population access to a healthy and improving space. The superintendents, however, saw that the new trend might provide an additional rationale for the Garden.⁸⁰ Thomson was the first to articulate the new philosophy in Calcutta and the extract below, from his 1856 Report, shows how he understood the British public park movement:

28. The local importance of the H.C. Garden has therefore I think never been sufficiently appreciated ...

29. The rapidity of the development of Calcutta during the last 50 years has undoubtedly been very great, but it is probably trifling in comparison to what may be expected in the next half century. The existence of a large area of open ground the property of the State in the immediate vicinity of a populous and rapidly increasing City is so important on Sanatary (*sic*) grounds, that no question can exist as to the propriety of retaining it. The value of ground in the neighbourhood of Calcutta is already considerable and may be expected to increase from year to year, so that the acquisition of land for the purpose of Parks will annually become more difficult. The area occupied by the Botanic Garden will probably ere long be entirely surrounded by a dense population, when its importance as a pure and healthy Spot will be even greater than at present.⁸¹

The Garden never kept visitor statistics so we do not know whether numbers did increase over time. It continued to be disadvantaged because of its location on the opposite side of the river to Calcutta. King in his first Report looked forward to more visitors.⁸² The next year, Henderson, the acting superintendent, estimated that there were about 1,500 visitors per month during the cold weather and said ‘... they (*orchids*) and ferns seem to excite more interest than any other plants both amongst Native and European visitors.’⁸³

⁷⁹ J.M. Milton, *State of Large Towns*, (1871).

⁸⁰ Providing public access to gardens was not a wholly new idea in India: at the same time as the seventeenth century Stewart monarchs were allowing visitors into St James’s and Green Parks in London, Mughal emperors were opening some of their gardens – see Habib, Irfan, ‘Notes on the Economic and Social Aspects of Mughal Gardens’ in Wescoat and Wolschke-Bulmahn (eds.) *Mughal Gardens*, 135.

⁸¹ BL IOC F/4/2695 No.190938, Report on the Honorable Company’s Botanic Garden, 24th September 1856.

⁸² RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1871-72, 1.

⁸³ RBG Kew MR 226: Annual Report of the Royal Botanical Gardens, Calcutta, 1872-73, 3.

A bridge over the Hooghly was finally opened in 1874. In his report the following year King wrote enthusiastically:

Visitors from Calcutta have hitherto been obliged to reach the garden by the river, and the unpleasantness of the crossing in the only kind of boat available, an ordinary dinghy, together with the necessity, after having crossed, of going through the grounds on foot, have hitherto made a visit to the garden rather an undertaking. The opening of the bridge across the river at Howrah has changed all this, and made it possible for residents in Calcutta to drive down to and through the garden without once leaving their carriages.⁸⁴

In fact the new bridge had less impact than anticipated on visitor numbers, as there was no direct route from Howrah Bridge to the Garden. Only in the early 1890s was the Shalimar Road extended all the way to the Botanic Garden, finally allowing fairly easy access from Calcutta. King worked hard to make sure that the visitors had something to look at. Orchids, palms and ferns were particular attractions. The plant houses that contained these plants did have some scientific purpose, but they also made the Garden a place of wonder and exotic display. King wanted the Garden to be well used. In 1882 he wrote that 'It is now a beautiful and shady park ... containing many beautiful and instructive specimens both of Indian and exotic plants. In it is now provided for the population of Calcutta an admirable means of instruction and recreation.'⁸⁵

⁸⁴ RBG Kew MR 226: Annual Report of the Royal Botanical Garden, Calcutta, 1874-75, 3.

⁸⁵ *ibid.*

By this time botanic gardens that offered scientific displays and attractions were beginning to operate in a competitive marketplace.⁸⁶ There was an increasingly interested population to consume what was on offer in nineteenth-century Britain. Similarly in Calcutta, soon to make its claim to be ‘the second city of the Empire,’⁸⁷ the Indian public was responding enthusiastically: even before it moved into its new building in 1878 the Imperial Museum was attracting over 100,000 visitors per year, and over a million went to the Calcutta International Exhibition in 1883-84.⁸⁸ The Government was willing to subsidise such attractions, provided they were shown to be educational and morally uplifting.

King realised that he needed to make the Botanic Garden’s case effectively in order to get his share of the support available. That is why he argued for improved access, and for steam launches to call at Sibpur, to ensure that visitors had a smooth and satisfying experience. He also stressed the “improving” nature of a visit to a botanic garden: ‘Public parks and gardens, such as this, are universally recognised as powerful agencies for refining and civilising the masses of the people ...’⁸⁹ King’s phraseology would have struck a chord with the administrators who read his reports, and his views chimed with those of Victorian Britain. Sir Joseph Hooker at Kew wrote in a similar vein suggesting that a gradual improvement in visitors’ behaviour at Kew might be attributable to ‘the natural beauties of the place, and the evidences of system and order with which visitors are confronted on entering the gates ...’⁹⁰

⁸⁶ Aileen Fyfe and Bernard Lightman (eds.), *Introduction to Science in the Marketplace: Nineteenth-Century Sites and Experiences* (Chicago, 2007).

⁸⁷ Seymour Eaton, *Up-to-date Business* (New York, 1900), 111, is one of several books that introduced this term at the end of the nineteenth century.

⁸⁸ Official Report of the Calcutta International Exhibition, 1883-84, (Bengal Secretariat Press, 1885), 24.

⁸⁹ RBG Kew MR 226: Annual Report of the Royal Botanic Garden, Calcutta, 1883-84, 2.

⁹⁰ Joseph Hooker, Report of the Director on the Royal Gardens, Kew, 1871, quoted in Endersby, *Imperial Nature*, 304.



Fig 28. Calcutta Botanic Garden, 1908; preparing for the Christmas sports of the Calcutta associated tradesmen, with the great banyan tree on the right (reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew).

However Joseph Hooker was very anxious to preserve Kew's scientific character. He opposed longer opening hours in 1877, arguing that 'if opened the whole day the Gardens will be regarded as a Park. Park-licence will insinuate itself & demands for luncheons, pic-nics and bands of music will follow.'⁹¹ Calcutta had to follow Kew in striking a balance, but it did not face Kew's visitor pressures, and King did not, to his relief, have to deal with the same democratic pressures. He never seems to have felt that numbers were becoming excessive, and was happy to have more visitors. In 1897 he said:

The number of visitors to the garden is steadily increasing. Even during the hot-weather and rainy seasons, during which in times past visitors used to be very few, parties of bicyclists have begun to make the garden a resort, the smoothness of the roads offering apparently a great attraction to people on wheels.⁹²

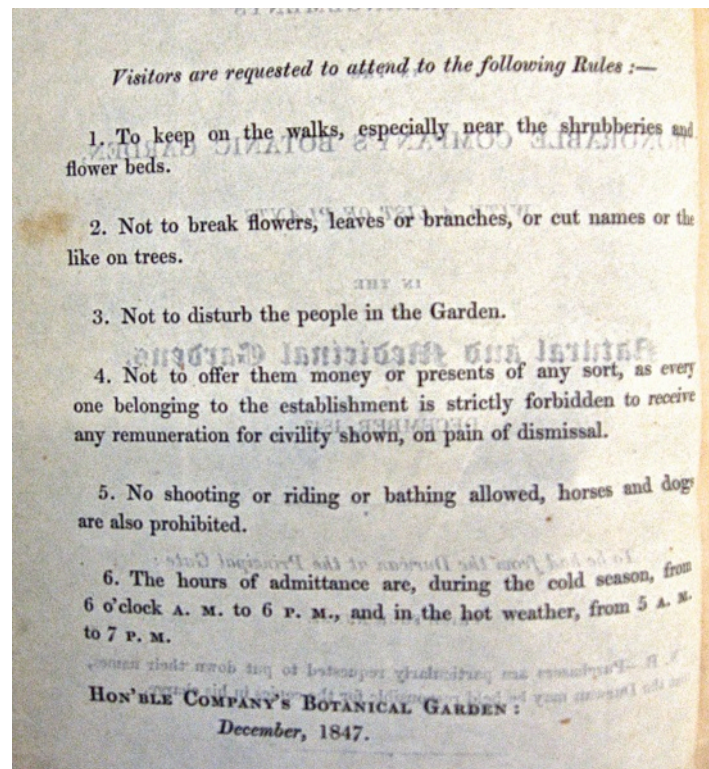
To help the increasing numbers of visitors get the most from their visit King issued a 30-page guidebook in 1895. King made it clear that 'the Garden is open to the Public gratuitously every day from sunrise to sunset',⁹³ and nowhere in his reports did he betray any anxiety about too many visitors.

⁹¹ Endersby, *Imperial Nature*, 306.

⁹² RBG Kew MR 227: Annual Report of the, Royal Botanic Garden, Calcutta, 1896-97, 1.

⁹³ King, *Guide to the Royal Botanic Garden, Calcutta*.

Of course there was sometimes a need to order and discipline visitors. Doreen Massey has described, ‘... the continuing daily negotiations and struggles, sometimes quiet and persistent, sometimes more forceful, through which day in day out these (public) spaces are produced.’⁹⁴ Indeed, she argues that the process of negotiation, played out against a background of unequal social relations, is what renders spaces genuinely public. Even in the highly controlled environment of colonial India access to the Garden was (and still is) negotiated. M’Clelland issued the first Garden rulebook in 1847.



*Fig 29. The first rules, issued by M’Clelland in 1847
(reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew).*

In the following years successive superintendents raised various concerns: Anderson complained about the inconsiderate driving of carriages and horses⁹⁵ and in 1873 Henderson was concerned that ‘Once or twice they (visitors) have carried off plants, and threatened native officials.’⁹⁶ A new and more modern menace appeared in the 1900s, causing Gage to write:

⁹⁴ Massey, *On Space*, 152.

⁹⁵ RBG Kew MR 226: Report on the condition of the Royal Botanic Gardens, Calcutta, 1861-62, 5.

Owing to the annoyance caused by the furious driving of some inconsiderate motorists, who appear to look upon the Garden avenues as racing tracks, it has been found necessary to erect large notices at each of the road entrances to the Garden warning motorists to drive slowly ...⁹⁷

By that time, however, the environs of the Garden were changing. It was no longer situated in a rural area with only villagers for neighbours. Calcutta had expanded on both banks of the Hooghly, rendering access difficult once more, and reducing the attraction of the Garden for visitors without their own transport. In 1913 Calder, acting in place of Gage, wrote rather gloomily:

Though no record is kept of the number of visitors to the Garden, it has been evident to those who live there that there has of late been a marked diminution in the numbers ... Of late both sides of the river have been rendered relatively impassable by the access of railways, coal depots etc., and throughout the year there has been only a very unreliable service by river.⁹⁸

The Garden as a commemorative site

*'Anthropologists and historians alike have drawn attention to the ways the material world that surrounds us is intricately intertwined with history and politics. The landscape in particular can have a mnemonic quality that enables social actors to re-experience events that happened long ago. Yet, the experiences that are inscribed into the landscape are not just sources of knowledge, morality or power, but also of multiple effects, such as melancholy, suffering and pain.'*⁹⁹

Perhaps more than most historic botanic gardens, the Calcutta Garden had its history inscribed on its landscape. Two hundred years or more after they were erected, the earliest monuments are still focal points in the Garden, and most avenues and paths have a name that recalls the work of some nineteenth-century botanist. Thus they form, as Simon Schama has described it, a '... landscape to carry the freight of history.'¹⁰⁰ The placing of monuments in the Garden echoed Mughal practice.

⁹⁶ RBG Kew MR 226: Annual Report of the Royal Botanical Gardens, Calcutta, 1872-73, 3.

⁹⁷ RBG Kew MR 216: Annual Report of the Royal Botanic Garden, Calcutta, 1910-11.

⁹⁸ RBG Kew MR 216: Annual Report of the Royal Botanic Garden, Calcutta, 1912-13, 1.

⁹⁹ From Call for Papers: proposed panel: 'Landscapes of war and conflict' 111th American Anthropological Association Annual Meeting (Borders and Crossings), 14-18th November 2012, San Francisco, USA.

¹⁰⁰ Schama, *Landscape and Memory*, 5.

Many nobles in the seventeenth and early eighteenth centuries chose to be buried in gardens they had established,¹⁰¹ and tombs commemorated them, in modest imitation of the practice started by Akbar when he built a magnificent garden tomb in Delhi for his father, Humayun.

The first monument was erected in the Garden less than ten years after its foundation. It is an elegant urn, with a circular frieze below, and it stands over three metres high. It commemorates Robert Kyd and is by the well-known British sculptor, Thomas Banks.¹⁰² The memorial was ordered shortly after Kyd died, and paid for privately. Its classical form suggests that the Garden is a place of distinction and intellectual endeavour, as well as mere gardening. That is in keeping with the function of memorials as suggested by Robert Travers: ‘...memorials to the dead were tools for displaying the assumed aristocratic manners of the East India Company service, and for promoting a narrative of sacrificial service on behalf of the empire’.¹⁰³

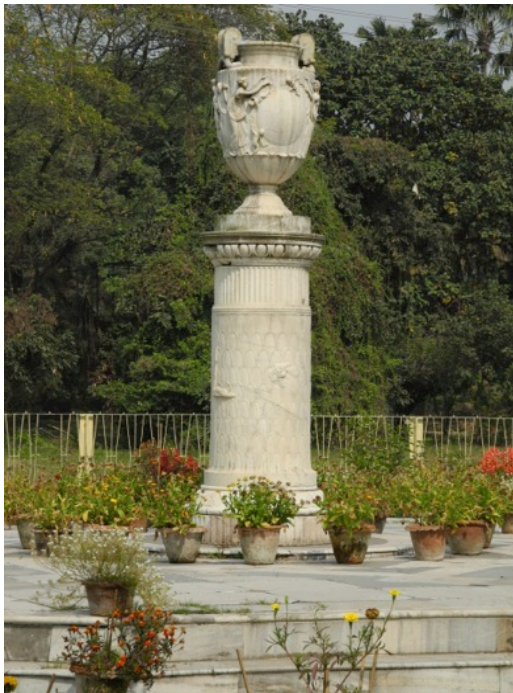


Figure 30. The monuments to Kyd and Roxburgh as they appeared in 2013.

¹⁰¹ Habib, Irfan, ‘Notes on the Economic and Social Aspects of Mughal Gardens’ in Wescoat and Wolschke-Bulmahn (eds.) *Mughal Gardens*, 135.

¹⁰² Thomas Banks also sculpted Warren Hastings’s bust in the National Portrait Gallery in London.

¹⁰³ Robert Travers, ‘Death and the Nabob: Imperialism and Commemoration in Eighteenth-Century India’, *Past and Present*, 196 (1) (2007), 83-124.

By placing the memorial where they did, Kyd's friends recognized that the Garden was his most significant legacy, but they also made a statement that the Botanic Garden was there to stay. By honouring Kyd so publicly, and, in a sense creating a consecrated space, they were making it clear to the Company that the Garden was a serious enterprise, meriting continued support.



Figure 31. The monuments to Nathaniel Wallich and William Jack.

The Kyd monument set a precedent: in 1822 a larger but less elegant memorial was built in honour of Roxburgh. During the following twenty-five years plainer stone monuments were erected in memory of two young botanists of great promise, William Jack (1795-1822)¹⁰⁴ and William Griffith (1810-45). These memorials performed a different function, reminding the world of what more might have been achieved, and of the sacrifice that could be involved in the investigation of tropical regions.

¹⁰⁴ William Jack (1795-1822) was a Scottish surgeon who spent most of his short working career in Southeast Asia, and published *Descriptions of Malayan Plants*.

After Wallich died in 1854 a substantial Egyptian-style pylon, with a simple inscription, was erected to commemorate him. The last outside monument, to Sulpiz Kurz, was put up in the 1870s. That was in the time of Sir George King, who has no monument in the Garden itself, but is publicly remembered by his profile carved in wood on a herbarium cabinet, now prominently displayed on the first floor landing of the Central National Herbarium building.



Figure 32. The memorial to George King.

Kyd's memorial is centrally located and is the focal point for several avenues. The other monuments are scattered about the Garden,¹⁰⁵ and are prominently indicated on almost all maps and plans. The Garden has thus become, among other things, a memorialised landscape and a shrine to distinguished botanists. The visitor is invited to read the inscriptions and contemplate their meaning. Kyd's monument does no more than name him as the founder of the Garden, but Roxburgh's inscription,¹⁰⁶ a charming and elegant composition by Bishop Heber, praises his botanical skills and the landscape he created. It highlights the beauty of the place and its potential spiritual effect:

Whoever you be
If this place soothes the mind with its sweetness

¹⁰⁵ This contrasts with the arrangement adopted at Buitenzorg, where the monuments to Dutch botanists are all aligned in one place – see Nadine Monem (ed.), *Botanic Gardens: a Living History*, (London 2007).

¹⁰⁶ Now almost obscured by repeated painting.

Or teaches you to think of God with reverence

You must hold in high honour

ROXBURGH¹⁰⁷

In contrast, the inscriptions on the memorials to Jack and Griffith are more straightforward, emphasising their brilliance and hard work. Wallich's is even simpler, describing him only as 'A most distinguished botanist and an indefatigable explorer.'

The language of the inscriptions reflects a changing approach to communication. The earliest ones, to Kyd and Roxburgh, are in Latin, and could have been read only by the better-educated Europeans. The inscriptions on the subsequent monuments are in English, reflecting the declining use of Latin in Victorian Britain, but on two of the other faces of Jack's memorial, translations are inscribed in the Persian and Devanagari scripts. They are interesting as they imply that Jack's friends in the 1820s expected educated local people to visit the Garden and appreciate Jack's work as a botanist, or grieve over his lost potential.

These monuments follow a British tradition of setting up memorials to list a person's qualities as a lesson for successors.¹⁰⁸ They are created because the dead person's peers think that he or she is worthy of being remembered, and they set examples for all the subsequent superintendents. The memorials reinforce the importance of the institution and make a claim for the founders to be remembered, whoever may control the territory. For botanists, they are also a reminder of the suffering and sacrifice involved in establishing their discipline in India.

When King wrote his guidebook in the 1890s, he realised that visitors would be able to find their way around the Garden more easily if the roads were named. There were many possible ways for King to do this. He could have used the names of local settlements or landscape features, or of significant Indian provinces, or of governors general and viceroys. His decision, however, was to add a new layer of meaning by honouring the botanists of India. King named the main avenues after the superintendents he felt had contributed most – Kyd, Roxburgh and Wallich. A fourth avenue was named after Joseph Hooker. Less important routes were named

¹⁰⁷ Opening lines of Bishop Heber's Latin tribute, as translated into English at the base of the monument.

¹⁰⁸ Professor Peter Robb, pers. comment, 2014.

after superintendents who had served for shorter periods (Griffith, Falconer, Thomson, Anderson and Clarke), important curators (Kurz and Scott) and other people who had made significant contributions to Indian botany (Hamilton, Carey and Wight). Finally minor tracks and paths were named after a miscellany of others. Only one or two avenues were named after obvious garden features, such as the banyan tree and the palmetum. King thus inscribed on the Garden a carefully graded pantheon of botanists to be admired. As a result, it has been suggested:

... wandering through the garden meant engaging in a de facto history lesson about Britain's botanical heroes ... If the staggering variety of natural marvels were testament to their scientific research, then their names embedded in the Garden's avenues and monuments situated them as the rightful keepers of *this* natural paradise, as the men who had, in fact, managed the exotics.¹⁰⁹

Or, as Doreen Massey has noted:

The identity of places is very much bound up with the *histories* which are told of them, *how* those histories are told, and which history turns out to be dominant.¹¹⁰

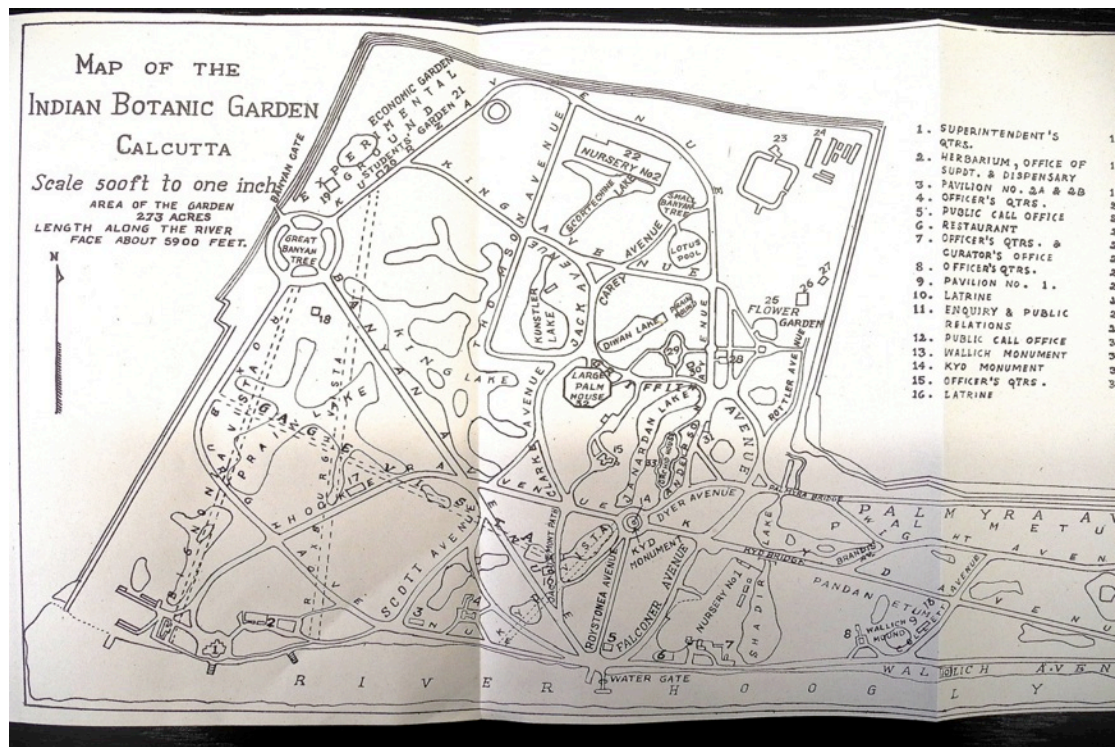


Figure 33. Map showing the names King gave to the Garden's roads and avenues (reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew).

¹⁰⁹ Romita Ray, *Under the Banyan tree: relocating the picturesque in British India* (New Haven, 2013), 149.

¹¹⁰ D. Massey, 'Places and Their Pasts,' *History Workshop Journal*, 39 (1995), vi.

Conclusion

In many ways this was a story of success. The Government was slow to say exactly how the space occupied by the Botanic Garden should be managed. As a result the superintendents were able to formulate a policy themselves, but they had to take into account visitors' aesthetic expectations, and always bear in mind that the authorities expected the Garden to be a practical and productive place, able to tell a story of bettering the lives of people in India, whether by introducing new crops, acclimatising trees, or growing medicinal plants.

By the 1840s it became clear that the space was not being well managed or maintained, and needed to be taken in hand. Griffith and M'Clelland initiated the process, but were not successful. By his attacks on their work the increasingly influential Joseph Hooker claimed a role for Kew in determining how Indian botanic gardens should appear, and made it clear that the Garden must be maintained as an aesthetically attractive space in future. From the 1850s the superintendents learned how to grow a wider range of plants, and to put on displays that attracted many visitors. From the 1860s government expectations that the Botanic Garden would provide a site for healthy and instructive relaxation, and for learning about the natural world, became clear. Attempts to inscribe science on the landscape were abandoned, and scientific practice was concentrated in covered spaces and in the herbarium.

This adroit management of space, and sensitivity to the changing expectations of officials and of botanists in Britain, preserved the reputation of the Garden. That reputation, and the Garden's improving appearance and productivity, shaped it as a place. Its growing confidence and productivity, meant that it had more to contribute and enabled the Garden to play an increasingly prominent role in the globalising late nineteenth-century networks, with a rapid rise in the number of plants exchanged.

Even so, the superintendents never quite established the degree of control they wanted over the landscape, any more than imperial Britain ever quite controlled India. There was a constant struggle to maintain boundaries against river currents and the local population. The local environment was too violent to be totally subjugated: cyclones continued to fell trees, floods swept over parts of the Garden – and, when all seemed well, an earthquake struck. However, perception was perhaps more important than reality. The superintendents were seen to have controlled and beautified the landscape, in keeping with new imperial priorities which aimed to use buildings and civic spaces to demonstrate the power and reach of the Raj, and its ability to grow what it wanted where it wanted: reassured that the landscape could be ordered, and be an ornament and source of education, British officials allowed the Garden the resources that it needed for its scientific work.

Conclusion

Calcutta Botanic Garden was an important site in the worldwide process of botanical knowledge formation in the nineteenth century. Studying it has provided a prism through which to examine how colonial science was practised at a particular site, how the colonial régime aspired to use science to improve agriculture, and how themes of display and instructive leisure were appropriated to reinforce imperial prestige. The complexity of botanic gardens means that there is always competition between their scientific, economic and aesthetic roles. Between 1833 and 1914 British officials in India, with occasional inputs from the Directors of the East India Company and later the India Office, developed increasingly coherent views about what the priorities of the Garden should be. Colonial officials generally accepted the Garden's ambition to lead the taxonomic project in India, but gradually decided that its responsibility for economic botany should go to more specialised forestry and agriculture departments. The British botanical establishment, represented after the 1840s by Kew Gardens, also became increasingly articulate. A central theme of the thesis has been the way in which the Garden tried to find a path between the changing expectations of sponsors and collaborators.

The Garden's size, its location in the capital of Britain's largest overseas possession and its longevity made it distinctive, and it was a node where several networks intersected. Its proximity to a major port meant that it was readily accessible to outside pressures and influences, but also enabled it to shape and sometimes coordinate botanical activity in India and the Indian Ocean region. At the same time, the Garden became increasingly important as a site of botanical display, and also the main source of nursery skills, which were fundamental to everything else that the Garden did.

As well as looking at the broader issues outlined above, this conclusion will reflect on how the Garden was run, and particularly the role and motivation of the superintendents and their staff. It will also assess the importance of changing botanical and horticultural practices, and the way that the Garden contributed to its various networks.

Looking first at the Garden's scientific work, we have noted that botany is often seen as a quintessential colonial investigatory science. There has been much interest in how scientific knowledge and practice diffused from the metropolitan 'centre' to the colonial 'periphery'. The thesis has looked at this in detail and found that the practice of botany in India does not support any generalised model of the 'diffusion of science'. Centre-periphery models fail to capture the complexity of the relationship, as the categories it presupposes hardly existed in India. Most India-based British botanists spent significant periods in Britain, and several occupied important roles in metropolitan science after they retired from India. Joseph Hooker, the pre-eminent botanist in Britain in the later nineteenth century, had spent three years in India, but he was only able to produce his authoritative *Flora of British India* in collaboration with botanists working in India, or seconded from there. The category of 'colonial scientist' is therefore difficult to maintain in the Indian context. Rather, the thesis supports the idea that knowledge was co-produced with metropolitan scientists, and there was a 'moving metropolis' with colonial botanists influencing those at the centre. It has also stressed that conditions changed throughout the nineteenth century: in particular, the improvement in communications allowed much closer relationships.

Latour's idea that science progresses via a series of 'centres of calculation,' has been a useful tool of analysis here. Wallich was a great collector, but the sheer size of his collection meant that he relied on botanists in Europe to describe and publish his finds. His action in moving the herbarium from Calcutta accelerated the description of what had been collected up to that date, but made it difficult for Wallich himself and his successors to describe the new species that were found in India after 1833. As we have seen, his successors almost all saw a need for a more independent Indian botany, a 'centre of calculation,' or what Anderson described as 'a working scientific

establishment,' equipped to identify and describe specimens, and later to enable botanists in India to write monographs on plant families.

Publishing was an important aspect of the Garden's work as a knowledge forming institution. If India was to have a measure of botanical independence then botanists working there needed to let others know the results of their investigations. In the early part of the nineteenth century Roxburgh and Carey succeeded in publishing much of the information available at the time about the Indian flora, in a format that could be used by the general reader. Wallich built on that, and more information became publicly available as a result of the work of botanists in Europe to whom he sent specimens from the herbarium he brought to London in 1828. However, the pace of collecting slowed significantly following the 1829 Finance Committee's examination of the Garden's work, and there was little botanical knowledge formation or publishing in Calcutta for the next thirty years, with the initiative passing to Robert Wight and other surgeons in South India.

New resources were found to allow the Garden to resume its leading role in the 1860s. That was partly because several government officials were affected by the Victorian enthusiasm for natural history, and believed that the British in India had a duty to investigate and describe the country's resources. Hooker reinforced the case with his articulate argument that taxonomy was key to progress in economic and medicinal botany as well.¹ As Chapter Four has shown, botany was successfully practised as a classificatory science in India during the thirty years after 1871, and Calcutta Botanic Garden was a productive knowledge-forming institution. Its continuous existence over a long period was important to that success.

The Garden revived its publishing activities in the 1880s when George King started producing *The Annals*. But by that time botanical writing had become more specialised: *The Annals* and Hooker's *The Flora of British India*, completed in 1897, provided detailed technical descriptions, but were not useful to anyone needing a popular and accessible account of the Indian flora. That lessened the Garden's capability to capitalise on its achievements: technical works did little to enthuse interested members of the public, or encourage support from officials. By 1900,

¹ Hooker and Thomson, *Flora Indica*, Introductory Essay, 3.

official support for the classificatory project was on the wane, partly because of the general decline in British interest in natural history. It was understandable that when officials leafed through the seven volumes of Joseph Hooker's *Flora of British India*, with its impenetrable technical descriptions of 14,000 plants, and the equally comprehensive six volumes of George Watt's *Dictionary of the Economic Products of India*, they must have felt that the task had been completed. That declining official interest had serious implications for the Botanic Garden, and showed itself in the declining salary of the superintendent and the ending of the extra grants that Sir George King had been able to attract. The Botanic Garden might have preserved more of its scientific credibility if King had set up a physiological laboratory in the 1870s, though it is doubtful whether he himself had the requisite skills.

Changes in the way science was viewed and interpreted in India mirrored what was happening in Britain. However, botanists in India may have been more deluded about their power to understand and interpret their environment because of the peculiarities of the colonial situation, which encouraged scientists:

‘to think that their unprecedented control over nature showed that European modes of thought and social organisation corresponded much more closely to the underlying realities of the universe.’²

The increasing British confidence in the power of science, however, was based more on the achievements of the physical sciences and engineering.³ In contrast, botany and natural history were beginning to seem imprecise, and to have little to offer towards the governments' new agricultural and health priorities, driven by continuing famines and epidemics. That reinforced the decline in official enthusiasm.

Even the taxonomic project had not been implemented as well as Hooker's and Watt's work might have implied and botany was still not able to order plants with comprehensive exactitude. Hooker himself admitted that *The Flora of British India* contained many errors, and the exact distribution of many plants was still poorly understood, as the late flowering of botanical investigation led by Wright Smith and Burkill in the 1900s demonstrated. There was also a need for local floras, and Prain showed the way with his *Flora of Bengal*, in 1903. At the same time, the growth of the

² Adas, *Machines as the Measure of Man*, 13-14.

³ Ibid., 202, 224-25.

Forests and Agriculture Departments in the 1900s created a modest new demand for the identification and classification of plants using the huge database of herbarium specimens and the botanical expertise at the Garden, so it continued to be funded to do some taxonomic work despite its diminished profile in the eyes of the authorities.

One of the things that made Calcutta Botanic Garden distinctive was its involvement with well-informed local people. Knowledge was formed not only in collaboration with metropolitan botanists but also by tapping into Indian scientific, technological and medicinal traditions. In contrast to practice in Europe, where botanists often did their own collecting, the Garden depended on a network of skilled local collectors, and employed some excellent Indian botanical artists. It also had committed and knowledgeable garden overseers, some of whom spent the whole of their working lives there. Outside the Garden, Wallich, and later King, formed a number of links with interested Indian landowners, doctors and writers. However, the thesis argues that the superintendents failed to take the initiative to develop relations with the gradually rising numbers of scientifically qualified Indians, which denied the Garden the support of an increasingly articulate group from the 1880s onwards.

Partly as a result, as was noted in Chapter Four, early Indian scientists tended to prefer the physical sciences, and to be rather unenthusiastic about botany, which they saw as a traditional colonial science, dominated by the IMS. It was only at the beginning of the twentieth century, when it became evident that some botanical training was needed as a basis for work in forestry and agriculture that the first professional Indian botanists began to emerge.

The thesis has made it clear that after knowledge formation, the main function of the Garden was economic botany. Chapter Five showed that the superintendents' attempts to transfer and acclimatise crops during the Garden's first forty years were rarely successful. Official disappointment that the Garden had brought so few practical benefits was one of the main reasons why the budget was reduced in 1829. Aware of this existential threat, Wallich made sure from 1834 that he played a prominent role on the Tea Committee. He also aligned the Garden closely with the Agri-Horticultural Society. Subsequently, the Garden made much of its role in the successful introduction of commercial tea growing, and that reassured the authorities

that the Garden could contribute successfully to economic projects. Thirty years later, Anderson was similarly aware of the need to make sure that the Garden played a leading role in the introduction of cinchona growing to India. By doing so he demonstrated how the Garden could work productively with the emerging imperial botanical network. However, cinchona growing in India was only partially successful. The thesis does not therefore support arguments that Kew and the colonial botanic gardens constituted a well-organised exploitative system that could easily shift crops from one part of the Empire to another. In India, the process was complicated and uncertain, and success usually involved many years of commitment, hard work and experiment. Crop transfer did, however, involve exploitative practices, both in the acquisition of land and the recruitment of labour. The Botanic Garden was not directly involved in such practices, but it did play its role in the ‘commodification’ of India’s plant products.

Other economic work was on a more modest scale: the Garden helped to introduce improved varieties of sugar cane, as well as getting mahogany trees to set seed in India. It was also responsible for introducing a number of Indian plants to Europe. Both Kew and Calcutta Botanic Garden regularly used these examples to publicise the value of maintaining botanic gardens. However, an important argument of the thesis is that the potential for the Garden to introduce economic crops was always more limited than British officials realised because the most important crop transfers had already taken place during the sixteenth and eighteenth centuries. The thesis shows that the fading hopes of crop transfer coincided with a new concern about agricultural productivity. The Botanic Garden did some experimental work on local crops in the 1890s, but by 1900 it was clear that India needed access to the specialised mycological, microbiological and chemical knowledge that had been built up by professional agricultural researchers in Europe and America. As a result, the colonial authorities gradually decided that responsibility for economic botany should be passed to more specialised forestry and agriculture departments.

The park-like nature of botanic gardens makes them different from other scientific institutions, and the third preoccupation of the superintendents was the Garden’s appearance, which changed greatly between 1833 and 1914. Chapter One has explained how the use of the word “garden” inevitably created expectations of

interesting or unusual plants being grown in an attractive space, and helped to define it as a place. Although the early superintendents had a lot of independence, they had to be aware of such expectations. Managing the Garden for aesthetic experience, as well as for scientific and economic work, became increasingly important. In a sense the British used the Garden as a site to show how they could mould and improve Bengal's 'tropical' landscape. Difficulties in making the site productive and secure also reflected British lack of ease in India.

The thesis has shown how the management of the Garden's space became a contested area after Griffith took over in 1842 and tried to inscribe science on the landscape. That turned out to be more difficult than anticipated, and Joseph Hooker was horrified at the results. He realised that success in other fields depended on the Garden providing an attractive environment for visitors, and published his views in a widely read book in 1854. His advice proved impossible to ignore: later superintendents successfully adapted to changing demands and created a Garden that was both attractive and scientifically respected. In the Garden's annual reports after 1871 there was something of a dialogue on landscaping, with King persuading the Lieutenant Governors to provide additional funds to beautify various sections of the Garden and bring the whole area under control. That allowed King finally to create a properly landscaped garden, though it took him a long time to get the results he wanted over the entire area. It was not until the 1880s, a hundred years after the Garden was founded, that King felt that the Garden was fully demarcated, secured and properly cultivated. In that he mirrored the Empire in finding it more difficult than anticipated to model India's space.

King's completed landscape was widely admired, and seen as a credit to British rule. In that sense the superintendents' work was crowned with success in a way that their scientific and economic efforts were not. We have noted how King built on his achievements by using history, and devices such as maps and guidebooks, to cement the Garden's reputation. King's achievements also reflected the new imperial emphasis on display, and the Victorian belief in the value of parks for healthful recreation and instruction. In the wider landscape, however, the Garden achieved less, and did not play a major role in raising awareness of deforestation and other threats to the colonial environment. As is explained in Chapter One, the later

superintendents failed to build on the pioneering work of Roxburgh and Wallich. During the period covered by the thesis the surgeon-botanists in West and South India did much more to make the authorities aware of environmental threats.

The Introduction examined botanists' sense of identity, and Chapter One considered the networks that they formed. Their remarkable enthusiasm for their subject, and their eagerness to participate in global collaborative networks, were key factors in the progress of the Botanic Garden. However, they should not be identified too closely with the Garden, which had other committed staff, and continued to function during the sometimes lengthy absences of the superintendents. For most of the period, the superintendents in Calcutta received a much more generous salary than their counterparts in Britain. They also had a chance to do more original work, to make more botanical discoveries, and to name more plants. In return, the superintendents were subject to direct official oversight, and success in their work required energy, good health and a broad range of skills. Not all the superintendents could offer those qualities all the time, but Wallich, Griffith, Anderson, King and Prain all established international botanical reputations, and some of them had metropolitan as well as Indian careers. The thesis has also noted that whilst scientists and officials had separate roles, the demarcation was not always very clear and there was a continual negotiation between the two groups. In nineteenth-century India, some administrators were amateur scientists, with a serious interest in botany. Similarly some colonial scientists, such as John Forbes Royle and Sir Richard Strachey, became influential administrators later in their careers.

Even though the Garden existed in a power structure where it was ultimately subordinate, the superintendents' strong identification with their science often gave them some autonomy, and enabled them to take the initiative in pursuing their botanical work. The thesis has attempted to bring out the complexity of their relationship with imperialism. There is little evidence from the superintendents' correspondence that they were eager to expand the political power of the Empire; they did not see the increase or maintenance of British power as their main reason for being in India. However, their science was enabled by Empire, and Chapter One shows that they were happy to use the Empire and its advancing frontiers for their collecting and investigations, as well as accepting its honours and awards. At times

they also participated in activities or projects aimed at moulding Indian behaviour, by promoting western ideas of horticulture and teaching botany to medical students, for instance. Whilst their clear scientific agenda differentiated the superintendents from civil officials, they remained willing participants in the broader cultural process of imperial domination.

The thesis has highlighted the need to examine the actual practice of botanists. Long experience and greater technical knowledge improved their nursery skills. By the end of the century the Garden had learned to grow a wide range of exotic plants by the skilled use of artificial environments. Plant transfer also became more successful thanks to the use of Wardian cases and faster transit times. Even so, Chapter Six made it clear that simple practical tasks such as labelling could be dauntingly difficult in India. Here, as in other cases, India failed to live up to colonial expectations: 'Imperial planners often thought that they controlled events in nature, but in truth nature often controlled them.'⁴

The thesis has stressed the importance of networks for colonial botanists. Thinking in terms of networks helps to visualise the Garden from an Indo-centric viewpoint. Networks involved not only exchanges of information by letter or journal, but also the despatch of living plants and seeds, herbarium specimens and drawings. Commitment to botany, and a substantial contribution to knowledge formation were conditions for membership of the international network, but "gentlemanly" qualities and administrative abilities were also important. It was the combination of scientific, managerial and social skills that made George King the most successful of all the superintendents.

The Garden's key scientific relationship after 1850 was with Kew, which often saw Calcutta as the premier colonial botanic garden. Kew was an important advocate and coordination point, and the relationship was remarkably positive and beneficial. It was based on trust as much as control, and Calcutta developed as a 'centre of calculation' with Kew's blessing. The Garden was thus able to provide the

⁴ John M. Mackenzie, *Empires of Nature and the Nature of Empires: Imperialism, Scotland and the Environment*: the Callander Lectures delivered at the University of Aberdeen (East Linton, 1997), 61.

institutional support that was key to India's successful involvement with the late nineteenth century global botanic network.

If Calcutta felt subordinate to Kew, it still felt that it should be the leading botanic garden in India, and, to a certain extent, in the Indian Ocean region. It always had ambitions to form collections representative of the whole of South and Southeast Asia. It did generally succeed in maintaining its primacy within India, greatly aided by its continuous existence, the high salary paid to the Superintendent and its closeness to the seat of authority. Even so, the hierarchy within India was only formalised when the superintendent in Calcutta was made director of the Botanical Survey of India in 1890.

The way in which government functioned changed too, and relations with officials altered over time. In his earlier days, Wallich had worked successfully using personal and informal patronage networks, but by the 1840s public accountability was becoming more significant. Control became even tighter and the relationship more formal after 1858, and new skills were then required to establish productive connections with the authorities. Whilst personal contacts remained important in British India, the administration in the later nineteenth century increasingly demanded loyalty to organisations rather than to individuals. By the 1870s no head of an institution could survive unless he had the skills to write detailed and timely reports, marshal statistics and justify the expenditure of every rupee in his budget.

The findings of this thesis are based on a wide range of archives and sources that are outlined in the Introduction and there is plenty of potential for further research. The appendices to the Garden's annual reports from 1871-1914, for example, contain very detailed information on the distribution and exchange of plants. An analysis of that information would provide a much better understanding of the networks of institutions and individuals that the Garden participated in. There is also scope to analyse centre-periphery relations in greater detail by looking at exactly when the Garden superintendents and other India-based botanists were at Kew, what they worked on, and how networks developed as a result. Recently, David Arnold has completed a valuable and revealing study of the motivations and achievements of

Nathaniel Wallich,⁵ and the very comprehensive Wallich correspondence in the Central National Herbarium in Kolkata offers the opportunity to take this work further. In addition, Tim Robinson has published a comprehensive account of the work of William Roxburgh,⁶ and Henry Noltie has written a three-volume study of the life and work of Robert Wight.⁷ There is, however, plenty of material on which to base studies of the work and impact of other superintendents and botanists such as Robert Kyd, John Forbes Royle, Thomas Anderson, George King, George Watt and David Prain, all of them significant figures in the story of Indian botany.

Very little has been written so far on the Indian response to the presence of a colonial scientific institution, and the Garden's cultural and social significance to the people of Bengal. Was it conceptualised by educated people as a place of learning, as Amitav Ghosh's novel *Sea of Poppies* suggests?⁸ We know that there were thefts from the Garden and other challenges from local people, but was conflict the prevailing state of affairs with the local population? Research in the local vernacular press might answer some of these questions and help to provide a more rounded picture of what the Botanic Garden represented.⁹

Apart from the Botanic Garden, there is a real need for further research on comparator institutions. There are now valuable studies on several scientific institutions in India,¹⁰ including Calcutta Medical College, but we lack any serious institutional history in English of the other major botanic gardens in the region - Peradeniya, Buitenzorg, and Singapore. Nor is there any comparison of the landscapes of the different gardens, and how they emerged. Similarly it would be useful to have more comprehensive historical studies of the Forest Research Institute and its magnificent campus at Dehra Dun, as well as the Indian Agricultural Research Institute.

⁵ Arnold, 'Plant Capitalism and Company Science,' 899-928.

⁶ Tim Robinson, *William Roxburgh: the Founding Father of Indian Botany*.

⁷ Henry Noltie, *The Life and Work of Robert Wight*.

⁸ Amitav Ghosh, *Sea of Poppies* (London, 2008), Part 1:3 & 6.

⁹ See Lester, 'Spatial concepts and the historical geographies of British colonialism,' 137, for an articulate plea for this approach.

¹⁰ Uma Das Gupta & D.P. Chattopadhyaya (eds.), *Science and Modern India: An Institutional History, c.1784-1947*, (Delhi, 2011).

On economic botany there are several books about the introduction of cinchona to India, but they tend to focus on the dramatic stories involved in finding the plants and seeds in South America, and carrying them away, rather than the aftermath and a proper assessment of the long-term value of the exercise. Similarly with tea, there are studies that focus on the establishment of tea growing in India, but little serious recent work on the development of the industry after the 1850s. It has been noted how Calcutta Botanic Garden benefitted from the enthusiasm for natural history in the early and mid-nineteenth century. Many officials shared that enthusiasm but there was a gradual decline in interest after the 1870s. An analysis of that change using official and private papers would also be very useful for historians of science.

In concluding, it is important to remember that there was nothing inevitable about Calcutta Botanic Garden (see Introduction). However, its early achievements were significant and encouraged other colonial powers in South and Southeast Asia to set up similar institutions. Those institutions in turn encouraged the authorities in India to maintain support so that Calcutta's Garden remained at least comparable to others such as Buitenzorg and Peradeniya. Even so, the process of writing this thesis has shown that Calcutta Botanic Garden did not quite live up to expectations. Botanists took a long time to organise themselves to provide a proper description of the Indian flora. Even when they did, they were slow in publishing their findings and had difficulty in finding a precise enough language to order plants comprehensively. They took a similarly long time to provide a really well landscaped garden, and made much less impact on Indian agriculture than had initially been hoped. In this, the Garden reflected the British perplexity that India could or would not realise its supposed economic potential. For the botanists, as for many of the colonial British, India proved to be more unpredictable and unknowable than they had expected.

The botanists were also slow to adjust to changes in scientific thinking. Wallich in particular failed to keep up with changes in taxonomic systems, and most of the superintendents persisted with an eighteenth century classificatory project when their sponsors and subjects began to want something else from botany. Attempts to understand the work and achievements of a colonial scientific institution like Calcutta Botanic Garden therefore remind us that we need to query any complacent view of progress created by privileged scientists.

Calcutta Botanic Garden did, however, play its part in the story of how most of humanity has come to see the world through the lens of a scientific approach pioneered in enlightenment Europe. There has been a great expansion of our botanical knowledge, and that has helped to increase productivity in agriculture, forestry and associated fields. But it is important to recognise that much was also lost in the process, and to appreciate how European botany rode ‘a wave of “objectification” by which specimens were wiped clean of cultural complexities in order to be pasted into folios of European herbaria.’¹¹ Plants are not just anonymous scientific units any more than human beings are just units of production.

The social, aesthetic, medicinal and religious significance of plants is coming to be more widely recognised again, both in India and in the West. Science has contributed an enormous amount, but it is never the only way of experiencing the world. Calcutta Botanic Garden’s dry herbarium specimens were important, but so were its artists and its landscape designers. Few descriptions of the Garden fail to mention that it is a beautiful place as well as a site for experiment and scientific investigation. That finally is its value - as a place where both the beauty and the scientific complexity of plants can be appreciated.

¹¹ Harold Cook, quoted in Schiebinger and Swan (eds), *Colonial Botany*, Introduction, 7.

Abbreviations

AHSI	Agricultural and Horticultural Society of India (Kolkata)
BL	British Library
BSA	Board of Scientific Advice (India)
BSI	Botanical Survey of India
CBG	Calcutta Botanic Garden
CNH	Central National Herbarium (Kolkata)
DC	Directors' Correspondence (Kew Archives)
DTC	Dawson Turner Correspondence (Natural History Museum)
EIC	East India Company
IHR	Institute of Historical Research (London)
IMS	Indian Medical Service
IOR	India Office Records (British Library)
MR	Miscellaneous Reports (Kew Archives)
NHM	Natural History Museum (London)
RBG Kew	Royal Botanic Gardens, Kew
WB	West Bengal

Bibliography

PRIMARY (UNPUBLISHED) MATERIAL

Archives

National Archives of India, Delhi

Public, Medical and Agricultural & Horticultural Series, 1869-1906

West Bengal State Archives, Kolkata

Financial Department, Medical Branch, Botanical Gardens, 1859-1908

Botanical Survey of India, Central National Herbarium Library and Archives, Kolkata

Wallich Correspondence

Agricultural and Horticultural Society, Kolkata

Minutes (1821-42)

British Library, London – India Office Records

Proceedings and Consultations (P series, 1786-1914),

East India Company Correspondence with India (E/4 series, 1786-1858)

Board of Control Records (F series, 1784-1858)

India Office Home Miscellaneous (H series)

India Office Military Department records (L/MIL series, 1786-1914)

India Office Public and Judicial Department (L/PJ series, 1795-1914)

India Office Records Official Publications (V series, 1786-1914)

European manuscripts

Additional manuscripts

Royal Botanic Gardens, Kew

Directors' Correspondence (DC) 52, 53, 54, 55, 56, 57, 153, 155, 156, 158, 160

Joseph Hooker Papers (JDH) 2/1/13: KIN

Miscellaneous Records (MR) 107, 113, 122, 216, 225, 226, 227

Munro Letters (MUN) 1

Wallich Letters

Natural History Museum, London

Dawson Turner Correspondence (DTC)

Royal Asiatic Society, London

Colebrooke Letters

Royal Botanic Gardens, Edinburgh

PRIMARY (PUBLISHED) MATERIAL

Official Papers

British Parliamentary Papers. *Report made to the committee appointed by the Lords of the Treasury in January 1838 to inquire into the management and present condition of the Royal Gardens at Kew, with Recommendations for its Future Administration*, by Lindley, John, and others, No. 4 of Royal Gardens Committee, 1838 (House of Commons Accounts and Papers, No. 292, Vol. XXIX.259, 1840)

British Parliamentary Papers. *Report from Select Committee on the Affairs of the East India Company, Vol. II. Evidence, pages 192-206, paras. 2326-2356, 13th August 1832 and 2357-2462, 14th August 1832. Appendix C*

Newspapers and journals

India

Annals of the Royal Botanic Garden of Calcutta, 1887-1914

The Calcutta Journal of Natural History, 1841-48

The Englishman (Calcutta)

Gleanings in Science, 1829-31

The India Review and Journal of Foreign Science and Arts, 1837-41

Journal of the Agri-Horticultural Society, 1842-67

Journal of the Asiatic Society of Bengal, 1832-1904

Proceedings of the Asiatic Society, 1865-1904

Records of the Botanical Survey of India, 1903-13

Transactions of the Agricultural and Horticultural Society of India, 1820-28

Britain

Gardener's Chronicle

Journal of the Kew Guild

Kew Bulletin

Nature

Philosophical Transactions of the Royal Society

Contemporary accounts, memoirs and autobiographies

'Lists of Staffs in Botanical Departments at home, and in India and the colonies', *Kew Bulletin* 1892, 1901 and 1911.

Anderson, T., 'Effects of the cyclone of the 5th October 1864 on the Botanic Gardens, Calcutta', *Journal of the Agricultural and Horticultural Society of India*, XIV.III, 150-70.

- Bendall, Cecil, *A Journey of Literary and Archaeological Research in Nepal and Northern India* (Cambridge, 1886).
- Bengal and Agra Annual Guide and Gazetteer for 1842* (Wm Rushton & Co, Calcutta).
- Blakeley, B.L., 'Botanical Survey of the Empire', *Kew Bulletin* (1905), 9-43.
- Bose, Pramatha Nath, Part III: 'Survey of Natural Science', in Mitra, Rajendralal, Hoernle, A. F. Rudolf and Bose, Pramatha Nath, *Centenary Review of the Asiatic Society of Bengal from 1784 to 1883* (Calcutta, 1885).
- Buckland, C.E., *Bengal under the Lieutenant Governors* (Calcutta, 1901).
- Colebrooke, Henry T., *Remarks on the Husbandry and Commerce of Bengal* (Calcutta, 1795).
- Crawford, D. G., *History of the Indian Medical Service* – 2 vols (London, 1914).
- Cunningham, David D., *Plagues and Pleasures of Life in Bengal* (London, 1907).
- M. de Candolle, 'On the Botany of India, and the Facilities afforded for its investigation by the Hon. East India Company' in *Edinburgh New Philosophical Journal*, Volume 9, 1830, 123-129.
- Dey, Kanny Lall, *The Indigenous Drugs of India* (Calcutta, 1896).
- Drury, H., *Handbook of the Indian Flora* (Travancore, 1864).
- Drury, H., *The Useful Plants of India alphabetically arranged with botanical descriptions, vernacular synonyms and notices of their value in commerce, medicine and arts* (Madras, 1858).
- Dutt, Uday Chand, *The materia medica of the Hindus* (Calcutta, 1877).
- Eatwell, W. C. B., *Rise and Progress of Rational Medical Education in Bengal* (Calcutta, 1860).
- Fayrer, Sir Joseph, *Recollections of My Life*, (London, 1890).
- Fortune, Robert, *A Journey to the Tea Countries of China* (London, 1852).
- Graham, Maria, *Journal of a Residence in India* (Edinburgh, 1812).
- Griffith, William, *On Some Remarkable Plants in the H C Botanic Gardens* (Calcutta, 1850).
- Griffith, William, *Posthumous Papers: Itinerary Notes Vol II Khasyah and Bootan (1837-38) and Afghanistan (1839-41)* (Calcutta, 1848).
- Griffith, William, *Posthumous Papers: Notulae ad Plantas Asiaticus* (Calcutta, 1849).
- Griffith, William, Report on the Honorable Company's Botanic Garden (Calcutta, 1843).
- Hooker, J. D. and Thomson, Thomas, *Flora Indica* (London, 1855).
- Hooker, J D., 'A Century of Indian Orchids', *Annals of the Royal Botanic Garden, Calcutta*, Vol 5, (1895), I.
- Hooker, J. D., *The Flora of British India*, 7 Vols (London, 1872-97).
- Hooker, J. D., *Himalayan Journals*, (London, 1854).
- Hooker, J. D., *Notes on a Tour in the Plains of India, the Himala, and Borneo* (London, 1848).
- The Imperial Gazetteer of India (Provincial Series): Bengal Vol. I* (Calcutta, 1909).
- Jacquemont, V. V., *Letters from India*, 2 Vols. (London, 1835).
- Kaempfer, Engelbert, *Amoenitatum exoticarum politico-physico-mediciarum* (Lemgo, 1712).

- Kaye, John W., *The Life and Correspondence of Charles, Lord Metcalfe* (London, 1854).
- King, George, 'A Short Account of Colonel Kyd', *Annals of the Royal Botanic Garden, Calcutta*, 4 (1893), 1-11.
- King, George, 'A Brief Memoir of William Roxburgh', *Annals of the Royal Botanic Garden, Calcutta*, 5 (1895), 1-9.
- King, George, *A Guide to the Royal Botanic Garden, Calcutta* (Calcutta, 1895).
- King, George, *A Manual of Cinchona Cultivation in India*, (Calcutta, 1880).
- King, Sir George, 'A Sketch of the History of Indian Botany', *Nature*, 60 (12 & 19 October 1899).
- Kurz, Sulpiz, *The Forest Flora of British Burma* (Calcutta, 1877).
- Markham, C. R., *Travels in Peru and India – the Collection of Cinchona Plants and their Introduction to India* (London, 1862).
- M'Clelland, John, *Plan of the arrangements in the ... Botanic Garden, with a list of Plants in the Natural and Medicinal Gardens*, (Calcutta, 1847).
- M'Clelland, John, *Memorandum – Regarding the differences between Dr. Wallich and the late W. Griffith* (Calcutta, 1848).
- Newman, W., *Handbook to Calcutta, historical and descriptive* (Calcutta, 1892).
- Oliver, Daniel, *First Book of Indian Botany* (London, 1869).
- Oliver, Francis W. (ed.), *Makers of British Botany: A Collection of Biographies by Living Botanists* (Cambridge, 1913).
- Piddington, Henry, *On the Scientific Principles of Agriculture* (Calcutta, 1854).
- Prain, David, 'A Sketch of the Life of Francis Hamilton', *Annals of the Royal Botanic Garden, Calcutta* 10 (Part II), 1905.
- Prain, David, *Bengal Plants*, (Calcutta, 1903).
- Prain, David, 'Obituary Notice: Sir George King', *Philosophical Transactions of the Royal Society* (1909), xi–xxviii.
- Roxburgh, William, *Hortus Bengalensis* (Serampore, 1814).
- Roxburgh, William, *Flora Indica* 3 Vols, (Serampore, 1832) (published by William Carey); in 1 Vol. (Calcutta, 1874) (published by C. B. Clarke).
- Roxburgh, William, *The Plants of the Coast of Coromandel*, 3 Vols. (London, 1795-1819).
- Royle, J. Forbes, 'Account of the Honorable Company's Botanic Garden at Seharanpur,' *Journal of the Asiatic Society of Bengal*, 2 (February 1832).
- Royle, J. Forbes, *Essay on the Productive Resources of India* (London, 1840).
- Royle, J. Forbes, *Illustrations of the Botany and Other Branches of Natural History of the Himalaya Mountains* (London, 1839).
- Stocqueler, Joachim, *The Handbook of India: A guide to the Stranger and the Traveller, and a Companion to the Resident* (London, 1844).
- Thiselton Dyer, W., *The Botanical Enterprise of the Empire* (London, 1880).
- Thomson, Thomas, 'Notes on the Herbarium of the Calcutta Botanic Garden, with special reference to the completion of the Flora Indica', *Journal of the Asiatic Society of Bengal*, Vol XXV pt v (1856), 405.
- Valentia, George, *Voyages and Travels to India, Ceylon and the Red Sea, Abyssinia and Egypt in the Years 1802-1806* (London, 1809).

Van Rheeде tot Drakenstein, H. A., *Hortus Malabaricus*, 12 vols. (Amsterdam, 1678-1703).

Voigt, J. O., *Hortus Suburbanus Calcuttensis: A Catalogue of the Plants which have been cultivated in the Hon. East India Company's Botanical Garden, Calcutta, and in the Serampore Botanical Garden* (Calcutta, 1845).

Wallich, Nathaniel, *Plantae Asiaticae rariores* (London, 1830-32).

Wallich, Nathaniel, *Tentamen florae Nepalensis illustratae* (Calcutta, 1824).

Watt, George, *A Dictionary of the Economic Products of India*, 6 vols. (Calcutta, 1889-96).

Wight, Robert and Walker-Arnott, G. A., *Prodromus florae peninsulae Indiae orientalis* (London, 1834).

Wight, Robert, *Icones plantarum Indiae orientalis; or, Figures of Indian plants*, Vols I-VI (Madras, 1838-53).

Web resources

Royal Botanic Gardens, Kew (2006). *Roxburgh's Flora Indica*. Published on the Internet; <http://www.kew.org/floraIndica/>

Wallich and Indian Natural History (NHM, British Library and Kew), www.kew.org/collections/wallich

Kew Directors' Letters, <http://plants.jstor.org/visual/kdas8852>

SECONDARY MATERIAL

Newspapers and journals

India

Asian Agri-History

Bengal Economic Journal

Bengal Past and Present

Bulletin of the Botanical Survey of India

Indian Economic and Social History Review

Indian Journal of the History of Science

Britain

Archives of Natural History

History Today

Isis

Journal of Imperial and Commonwealth History

Journal of the Royal Asiatic Society

Journal of the Royal Horticultural Society

Journal of the Kew Guild

Modern Asian Studies

Nature

Past and Present

Books and articles

‘The 150th Anniversary of the Royal Botanic Garden, Calcutta’, *Kew Guild*, 1943, 297-8.

‘British botanic gardens and stations’. *Nature* 104, 2610 (Nov 1919).

Adas, Michael, *Machines as the Measure of Man: Science, Technology and Ideologies of Western Dominance* (Ithaca, 1989).

Agar, Jon, *Science in the Twentieth Century and Beyond* (London, 2012).

Allen, David E., *The Naturalist in Britain: A Social History* (Harmondsworth, 1978).

Allen, David E., *Naturalists and Society: The Culture of Natural History in Britain, 1700-1900* (Farnham, 2001).

Archer, Mildred, ‘India and Natural History: the Role of the East India Company, 1785-1858’, *History Today*, (Nov 1959), 736-743.

Arnold, David, ‘Envisioning the Tropics: Joseph Hooker in India and the Himalayas, 1848-1850’, in Felix Driver and Luciana Martins (eds.), *Tropical Visions in an Age of Empire* (Chicago, 2005).

Arnold, David, ‘Plant Capitalism and Company Science: the Indian Career of Nathaniel Wallich,’ *Modern Asian Studies* 42, 5 (2008), 899-928.

Arnold, David, *Everyday Technology* (Chicago, 2013).

Arnold, David, *Science, Technology and Medicine in Colonial India* (Cambridge, 2000).

Arnold, David, *The Tropics and the Travelling Gaze: India, Landscape and Science, 1800-1856* (Seattle, 2006).

Axelby, Richard and Nair, Savithri Preetha, *Science and the Changing Environment in India, 1780-1920: a Guide to the Sources in the India Office Records* (London, 2010).

Axelby, Richard, ‘Calcutta Botanic Garden and the Colonial Re-ordering of the Indian Environment,’ *Archives of Natural History*, 35 (1) (2008), 150-163.

Baber, Zaheer, *The Science of Empire: Scientific Knowledge, Civilisation and Colonial Rule in India* (Albany, 1996).

Barber, Lynn, *The Heyday of Natural History* (London, 1980).

Barrow, Ian J., *Making History, Drawing Territory: British Mapping in India 1756-1905* (Delhi, 2005).

Basalla, George, ‘The Spread of Western Science’, *Science*, Vol 156, 5 May 1967, 611-22.

Bayly, C. A., *The Birth of the Modern World* (Oxford, 2004).

Bayly, C. A., *Empire and Information: Intelligence Gathering and Social Communication in India, 1780-1870* (Cambridge, 2000).

Bayly, C. A., *Indian Society and the Making of the British Empire* (Cambridge, 1988).

Bayly, C. A., *Recovering Liberties: Indian Thought in the Age of Liberalism and Empire*, (Cambridge, 2011).

Beattie, James, Melillo, Edward and O’Gorman, Emily, *Eco-Cultural Networks and the British Empire* (London, 2015).

Beattie, James, *Empire and Environmental Anxiety* (London, 2011).

Bennett, Brett M. & Hodge, Joseph M. (eds), *Science and Empire: Knowledge and Networks of Science across the British Empire, 1800-1970* (Basingstoke, 2011).

Biswas, A.K. (ed.), *The Original Correspondence of Sir Joseph Banks relating to the foundation*

- of the Royal Botanic Garden, Calcutta (Calcutta, 1950).
- Biswas, A. K. (ed.), *The 150th anniversary volume of the Royal Botanic Garden, Calcutta* (Calcutta, 1942).
- Blunt, Wilfred, *Linnaeus: the Compleat Naturalist* (London, 1971).
- Brockway, Lucile, 'Plant Imperialism', *History Today* XXXIII (July 1983), 31-36.
- Brockway, Lucile, 'Plant Science and Colonial Expansion: the Botanical Chess Game,' in *Seeds and Sovereignty: the Use and Control of Plant Resources*, ed. Jack Kloppenburg Jr. (Durham NC, 1988)
- Brockway, Lucile, *Science and Colonial Expansion: the Role of the British Royal Botanic Gardens* (New York, 1979).
- Burkill, I H, *Chapters on the History of Botany in India* (Delhi, 1965).
- Burkill, I. H., 'David Prain. 1857-1944' in *Obituary Notices of Fellows of the Royal Society*, Vol. 4, No. 13, (November, 1944), 742-770.
- Bynum, W. F., *Science and the Practice of Medicine in the Nineteenth Century* (Cambridge, 1994).
- Cannadine, David, *Ornamentalism: How the British Saw Their Empire* (London, 2001).
- Cantor, Geoffrey, *Quakers, Jews and Science* (Oxford, 2005)
- Carter, Howard, *Sir Joseph Banks* (London, 1988).
- Chakervarti, B. B., 'Introduction of Tea plantation in India', *Bengal Past & Present (BPP)*, LXI (1941), 55-64.
- Chakrabarti, Pratik, 'Empire and Alternatives: *Swietenia febrifuga* and the Cinchona Substitutes' in *Medical History*, 2010 January, 54(1), 75-94.
- Chakrabarti, Pratik, *Western Science in Modern India* (New Delhi, 2004).
- Chatterjee, D., 'Early History of the Royal Botanic Garden, Calcutta', *Nature*, 161 (Mar 1948), 362.
- Chaudhuri, K. N., (ed.), *The Economic Development of India under the East India Company, 1814-1858*, (Cambridge, 1971).
- Cohn, Bernard S. 'Representing Authority in Victorian India' in Hobsbawm, Eric and Ranger, Terence, (eds.), *The Invention of Tradition* (Cambridge, 1983).
- Cohn, Bernard S., *Colonialism and Its Forms of Knowledge: the British in India* (Princeton, 1996).
- Cooper, Frederick & Stoler, Ann Laura (eds.), *Tensions of Empire: colonial cultures in a bourgeois world* (Berkeley, 1997).
- Crawford, D. G., *Roll of the Indian Medical Service, 1615-1930* (London, 1930).
- Crosby, Alfred W., *Ecological Imperialism: the Biological Expansion of Europe (900-1900)*, (New York, 1986).
- Crosby, Alfred W., *The Columbian Exchange: Biological and Cultural Consequences of 1492* (Westport, 2003).
- Crosland, Maurice, *Scientific Institutions and Practice in France and Britain, 1700-1870* (Farnham, 2007).
- Dadachanji, B. E., *History of Indian Currency and Exchange* (Bombay, 1934).
- Damodaran, Vinita, Winterbottom, Anna and Lester, Alan, *The East India Company and the Natural World* (Basingstoke, 2015).
- Desmond, Ray, *Dictionary of British and Irish Botanists and Horticulturists*, (London, 1994).
- Desmond, Ray, *Sir Joseph Dalton Hooker, Traveller and Collector*, (Woodbridge, 1999).
- Desmond, Ray, *The European Discovery of the Indian Flora* (Oxford, 1992).
- Dionne, Russell & MacLeod, Roy, 'Science and Policy in British India, 1858-1914: Perspectives on a Persisting Belief' in Habib, Irfan and Raina, Dhruv (eds.), *Social*

- History of Science in Colonial India* (New Delhi, 2007).
- Drayton, Richard, 'Science, Medicine and the British Empire', in Robin W. Winks (ed.), *The Oxford History of the British Empire, Vol V Historiography*, (Oxford, 1999).
- Drayton, Richard, *Nature's Government: Science, Imperial Britain, and the 'Improvement' of the World* (London, 2000).
- Driver, Felix & Martins, Luciana (eds.), *Tropical Visions in an Age of Empire* (Chicago, 2005).
- Dudeja, Vijay (ed.), *In Full Bloom (a history of the Agri-Horticultural Society of India)*, (Calcutta, 1996).
- Eastwood, David, 'The Age of Uncertainty: Britain in the Early-Nineteenth Century,' *Transactions of the Royal Historical Society*, Sixth Series, Vol. 8 (1998), 91-115.
- Edgerton, David, *The Shock of the Old: Technology and Global History Since 1900* (London, 2006).
- Edney, Matthew H., *Mapping an Empire: the geographical construction of British India, 1765-1843* (Chicago, 1997).
- Elliott, Paul A, *Enlightenment, Modernity and Science: Geographies of Scientific Culture and Improvement in Georgian England* (London, 2010)
- Endersby, Jim. *Imperial Nature: Joseph Hooker and the Practices of Victorian Science* (Chicago, 2008).
- Ernst, Waltraud, *Mad Tales from the Raj* (London, 1991).
- Fieldhouse, D. K., *Economics and Empire, 1830-1914* (London, 1984).
- Foucault, Michel, *The Order of Things: an archaeology of the human sciences* (London, 2001).
- Frodin, David, *Guide to Standard Floras of the World* (Cambridge, 2001).
- Fyfe, Aileen and Lightman, Bernard (eds.), *Science in the Marketplace: Nineteenth-Century Sites and Experiences* (Chicago, 2007).
- Gadgil, Mahdavi & Guha, R, *This Fissured Land: an Ecological History of India* (Delhi, 1993).
- Gage, A. T., *History of the Linnean Society of London* (London, 1938).
- Gage, A. T., 'The Royal Botanic Garden, Calcutta', *Journal of the Royal Horticultural Society* Vol. LI, part 1 (1926), 71-81.
- Gascoigne, J., *Science in the Service of Empire: Joseph Banks, the British State, and the Uses of Science in the Age of Revolution* (Cambridge, 1998).
- Ghosh, S. C., 'The Utilitarianism of Dalhousie and the Material Improvement of India', *Modern Asian Studies*, 12, 1 (1978), 97-110.
- Gopal, Sarvepalli, *British Policy In India (1858-1905)* (Cambridge, 1965).
- Goswami, Manu, *Producing India: from Colonial Economy to National Space* (Chicago, 2004).
- Grove, Richard, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860* (Cambridge, 1995).
- Grove, Richard, *Ecology, Climate and Empire: colonialism and global environmental history, 1400-1940* (Cambridge, 1997).
- Grove, Richard, Damodaran, Vinita and Sangwan, Satpal (eds.), *Nature and the Orient* (Delhi, 1998).
- Habib, Irfan & Raina, Dhruv (eds.), *Social History of Science in Colonial India* (New Delhi, 2007).
- Habib, Irfan, 'Notes on the Economic and Social Aspects of Mughal Gardens' in

- James L. Wescoat, Jr. and Joachim Wolschke-Bulmahn (eds.) *Mughal Gardens: Sources, Places, Representations, and Prospects* (Harvard, 1996).
- Harland-Jacobs, Jessica L., *Builders of Empire: Freemasonry and British Imperialism, 1717-1927* (Chapel Hill, 2007).
- Harrison, Mark 'The Calcutta Botanic Garden and the Wider World, 1817-46' in Uma Das Gupta & D.P. Chattopadhyaya (eds.), *Science and Modern India: an Institutional History, c.1784 - 1947* (Delhi, 2011).
- Harvey, David, *Spaces of Capital: towards a Critical Geography* (London, 2001).
- Hastings, R.B., 'The Relationship between the Indian Botanic Garden, Howrah and the Royal Botanic Gardens, Kew in Economic Botany', *Bulletin of the Botanical Survey of India*, Vol. 28 1-4 (1986), 1-12.
- Headrick, Daniel R., *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (New York, 1981).
- Headrick, Daniel R., *Tentacles of Progress: Technology Transfer in the Age of Imperialism, 1850-1940* (New York, 1988).
- Hill, Arthur, 'The History and Functions of Botanic Gardens', *Annals Missouri Botanic Gardens*, (1915).
- Hobhouse, H., *Seeds of Change: six plants that transformed mankind* (London, 2007).
- Hobhouse, Penelope, *Plants in Garden History* (London, 1997).
- Hobsbawm, Eric, *The Age Of Empire* (London, 1987).
- Holmes, Katie, Martin, Susan K & Mirmohamadi, Kylie, *Reading the Garden: the Settlement of Australia* (Melbourne, 2008).
- Holmes, Richard, *The Age of Wonder* (London, 2008).
- Honigsbaum, M. *The Fever Trail: the hunt for the cure for malaria* (London, 2001).
- Hurd, John & Kerr, Ian, *India's Railway History: A Research Handbook* (Leiden, 2012).
- Huxley, Leonard, *Life and Letters of Sir Joseph Dalton Hooker* (London, 1918).
- Hyam, Ronald, *Britain's Imperial Century, 1815-1914* (Basingstoke, 2002).
- Hyams, E. & Macquitty, W., *Great Botanical Gardens of the World* (London, 1985).
- Inden, R, *Imagining India* (London, 2000).
- Jack, Ian, *Mofussil Junction: Indian encounters, 1977-2011* (London, 2013).
- Jardine, N., Secord J. A. and Spary, E. C., *The Cultures of Natural History* (Cambridge, 1996).
- Johnson, Robert, *British Imperialism*, (Basingstoke, 2003).
- Keay, John, *The Great Arc* (London, 2000).
- Kejariwal, O. P., *The Asiatic Society of Bengal and the Discovery of India's Past* (Oxford, 1999).
- Kling, Blair B, *Partner in Empire: Dwarkanath Tagore and the Age of Enterprise in Eastern India* (California, 1976).
- Kopf, David, *British Orientalism and the Bengal Renaissance* (Calcutta, 1969).
- Kumar, Deepak, 'Science in Agriculture: a study in Victorian India', in Rahman, A. (ed.), *Science and Technology in Indian Culture: a Historical Perspective* (New Delhi, 1984).
- Kumar, Deepak 'The Evolution of Colonial Science in India: Natural History and the East India Company' in Mackenzie, J. (ed.), *Imperialism and the Natural World* (Manchester, 1990).
- Kumar, Deepak (ed.), *Science and Empire: Essays in Indian Context, 1700-1947* (Delhi, 1991).
- Kumar, Deepak & Macleod, Roy (eds.), *Technology and the Raj, 1700-1947* (Delhi,

- 1995).
- Kumar, Deepak, 'Racial Discrimination and Science in Nineteenth Century India', *Indian Economic and Social History Review*, XIX (1983), 63-82.
- Kumar, Deepak, 'Reconstructing India: Disunity in the Science and Technology for Development Discourse, 1900-1947', in Macleod, Roy, *Nature and Empire: Science and the Colonial Enterprise*, *Osiris*, 2nd series, 15 (Chicago, 2000).
- Kumar, Deepak, *Science and the Raj, 1857-1905* (Delhi, 1995).
- Laidlaw, Zoë, *Colonial Connections 1815-45: patronage, the information revolution and colonial government* (Manchester, 2005).
- Laird, M. A. (ed.), *Bishop Heber in Northern India: selections from Heber's Journal* (Cambridge, 1971).
- Lamb, Christian, *This Infant Adventure: the Offspring of the Royal Botanic Garden, Kew* (London, 2010).
- Lambert, David and Lester, Alan (eds), *Colonial Lives across the British Empire: Imperial Careerings in the Long Nineteenth Century* (Cambridge 2006).
- Larwood, H. J. C., 'Western Science in India before 1850', *Journal of the Royal Asiatic Society* (1962), 62-76.
- Latour, Bruno, *Science in Action: How to Follow Scientists and Engineers through Society* (Milton Keynes, 1987).
- Lefebvre, Henri, *The Production of Space* (Oxford, 1991).
- Lester, Alan, 'Spatial concepts and the historical geographies of British colonialism' in Thompson, Andrew S. (ed.), *Writing Imperial Histories* (Manchester, 2013).
- Livingstone, David, *Putting Science in Its Place: Geographies of Scientific Knowledge* (Chicago, 2003).
- Livingstone, David and Withers, Charles (eds.), *Geographies of Nineteenth Century Science* (Chicago, 2011).
- Llewellyn-Jones, Rosie, *The Last King in India: Wajid Ali Shah* (London, 2014).
- Mabberley, D. J., *Jupiter Botanicus: Robert Brown of the British Museum* (Braunschweig, 1985).
- Mackay, David, 'Agents of Empire: the Banksian collectors and evaluation of new lands' in Miller, David Philip, and Reill, Peter Hans, (eds.), *Visions of Empire: Voyages, Botany and Representations of Nature* (Cambridge, 1996).
- Mackay, David, *In the Wake of Cook: Exploration, Science and Empire, 1780-1801* (London, 1985).
- Mackenzie, John M. (ed.), *Imperialism and the Natural World* (Manchester, 1990).
- Mackenzie, John M., *Empires of Nature and the Nature of Empires: Imperialism, Scotland and the Environment: the Callander Lectures delivered at the University of Aberdeen* (East Linton, 1997).
- Mackenzie, John M. and Devine, T. M., *Scotland and the British Empire* (Oxford, 2011).
- Macleod, Roy (ed.), *Nature and Empire: Science and the Colonial Enterprise* (Chicago, 2001).
- Macleod, Roy, 'On Visiting the "Moving Metropolis": reflections on the architecture of imperial science', *Historical Records of Australian Science*, 5, 3 (1982).
- Macleod, Roy, 'Scientific Advice for British India: Imperial Perception and Administrative Goals, 1898-1923', *Modern Asian Studies*, 9, 3 (1975), 343-384.
- Macleod, Roy, 'Whigs and Savants: Reflections on the Reform Movement in the Royal Society, 1830-48' in Inkster, Ian and Jack Morrell (eds.), *Metropolis and Province: Science in British Culture, 1780-1850* (London, 1983).
- Macleod, Roy, *The 'Creed of Science' in Victorian England* (Farnham, 2000).

- Mann, Harold H., 'The Early History of the Tea Industry in North-East India', *Bengal Economic Journal*, 1918.
- Mantena, Karuna, *Alibis of Empire: Henry Maine and the Ends of Liberal Imperialism* (Princeton, 2010).
- Marshall, P. J., *Problems of Empire: Britain and India, 1757-1813* (London, 1968).
- Marshall, P. J., *East Indian Fortunes: the British in Bengal in the Eighteenth Century* (Oxford, 1976).
- Marshall, P. J., *Bengal: the British Bridgehead. Eastern India, 1740-1828* (Cambridge, 1987).
- Massey, Doreen, 'A Global Sense of Place,' *Marxism Today* 38 (1991), 24-29.
- Massey, Doreen, 'The conceptualization of place' in *A place in the world? Places, cultures and globalization* (Oxford, 1995),
- McCracken, Donal P., *Gardens of Empire* (Leicester, 1997).
- McDonald, Donald, *Surgeons Two and a Barber: Being Some Account of the Life and Work of the Indian Medical Service (1600-1947)* (London, 1950).
- Mehera, S. K., *The Indian Tea Industry* (cyclostyled history, Calcutta, 1997).
- Merrill, Lynn, *The Romance of Victorian Natural History* (New York, 1989).
- Metcalf, Thomas, *Aftermath of Revolt: India 1857-70* (Princeton, 1964).
- Metcalf, Thomas, *Imperial Connections: India in the Indian Ocean Arena* (London, 2008).
- Miller, David Philip, 'Joseph Banks and "centres of calculation" in late Hanoverian London' in Miller, David Philip, and Peter Hans Reill (eds.), *Visions of Empire: Voyages, Botany and Representations of Nature* (Cambridge, 1996).
- Miller, David Philip, and Reill, Peter Hans (eds.), *Visions of Empire: Voyages, Botany and Representations of Nature* (Cambridge, 1996).
- Misra, B. B., *The Central Administration of the East India Company, 1773-1834* (Manchester, 1959).
- Monem, Nadine (ed.), *Botanic Gardens: a Living History* (London, 2007).
- Morrell, Jack, and Arnold Thackray, *Gentlemen of Science: Early Years of the British Association for the Advancement of Science* (Oxford, 1981).
- Morrell, Jack, *Science, Culture and Politics in Britain, 1750-1870* (Farnham, 1997).
- Morton, A. G., *History of Botanical Science: An Account of the Development of Botany from Ancient Times to the Present Day* (London, 1981).
- Mukherji, S. N., *Sir William Jones: a Study in Eighteenth Century British Attitudes to India* (Cambridge, 1968).
- Musgrave, Toby & Will, *An Empire of Plants: People and Plants that Changed the World* (London, 2001).
- Nagar, Khyati, 'Between Calcutta and Kew: The Divergent Circulation and Production of *Hortus Bengalensis* and *Flora Indica*' in Lightman, Bernard, McOuat, Gordon and Stewart, Larry (eds.), *The Circulation of Knowledge Between Britain, India and China: The Early-Modern World to the Twentieth Century* (Leiden, 2013).
- Nandy, Ashis, *Science, Hegemony and Violence* (Delhi, 1990).
- Nicolson, Dan H., 'A History of Botanical Nomenclature', *Annals of the Missouri Botanical Garden* 78 (1991), 33-56.
- Noltie, Henry J., 'A botanical group in Lahore, 1864', *Archives of Natural History*, Vol. 38, No. 2 (2011), 267-277.
- Noltie, Henry J., Articles on 'Calcutta Botanic Garden', 'Indian Botanic Gardens', 'Royal Botanic Gardens Peradeniya' and 'Saharunpur Botanic Garden' in P. Taylor (ed.), *The Oxford Companion to the Garden* (Oxford, 2006).
- Noltie, Henry J., *Robert Wight and the Botanical Drawings of Rungiah and Govindoo* 3 vols: 1 – *The Life and Work of Robert Wight*; 2 – *Botanical drawings by Rungiah and Govindoo*;

3 – *Journeys in Search of Robert Wight* (Edinburgh, 2007).

- Ogborn, Miles, *Indian Ink: Script and Print in the Making of the English East India Company* (Chicago, 2007).
- Patnaik, Naveen, *The Garden of Life* (New York, 1993).
- Peers, Douglas M., *Between Mars and Mammon: Colonial Armies and the Garrison State in India 1819-35* (London, 1995).
- Pettigrew, Jane, 'The Origins of Indian Tea', in *Tea Muse*, Monthly Newsletter, August 2000 (http://www.teamuse.com/article_000803.html) accessed on 7th February 2014)
- Philip, Kavita, *Civilising Natures: Race, Resources, and Modernity in Colonial South India* (New Jersey, 2003).
- Philips, P. H., *The East India Company, 1784-1834* (Manchester, 1961).
- Porter, Andrew, *Religion Versus Empire? British Protestant missionaries and overseas expansion, 1700-1914* (Manchester, 2004).
- Porter, Theodore M., *The Rise of Statistical Thinking, 1820-1900* (Princeton, 1986).
- Prain, David, 'History in Botanical Study', *Essex Naturalist* (1931).
- Prakash, Gyan, *Another Reason: Science and the Imagination of Modern India* (Princeton, 1999).
- Pyenson, Lewis, *Empire of Reason: Exact Sciences in Indonesia, 1840-1940* (Leiden, 1989).
- Rahman, A, (ed.), *Science and Technology in Indian Culture: a Historical Perspective* (New Delhi, 1984).
- Raj, Kapil, 'Colonial Encounters and the Forging of New Knowledge: Great Britain and India 1760-1850', in Macleod, Roy, *Nature and Empire: Science and the Colonial Enterprise, Osiris, 2nd series* (Chicago, 2000).
- Raj, Kapil, *Relocating Modern Science* (London, 2010).
- Rajan, Ravi, *Modernising Nature: Forestry and Imperial Eco-Development 1800-1950* (Oxford, 2006).
- Ranga Achari, K., *A Manual of Elementary Botany for India* (Madras, 1916).
- Ray, Romita, *Under the banyan tree: relocating the picturesque in British India* (New Haven, 2013).
- Raychaudhuri, Tapan, *Europe reconsidered: perceptions of the West in nineteenth century Bengal* (New Delhi, 2002).
- Rehbock, Philip, *The Philosophical Naturalists: Themes in Early Nineteenth Century British Biology* (Madison, 1983).
- Riddick, John F., *Who Was Who in British India* (Westport, 1998).
- Robinson, Tim, *William Roxburgh: the Founding Father of Indian Botany*, (Chichester, 2008).
- Rocher, Rosanne and Ludo, *The Making of Western Indology: Henry Thomas Colebrooke and the East India Company*, (London, 2011).
- Rose, Sarah, *For All the Tea in China* (London, 2009).
- Rosselli, John, *Lord William Bentinck: the Making of a Liberal Imperialist 1774-1839* (London, 1974).
- Rothermund, Dietmar, *An Economic History of India* (London, 2000).
- Roy, Tirthanker, *India in the World Economy: From Antiquity to the Present*, (Cambridge, 2012).
- Sangwan, Satpal, 'From Gentlemen Amateurs to Professionals: Reassessing the Natural Science Tradition in Colonial India 1780-1840,' in Richard H Grove et al.

- (eds.), *Nature and the Orient*, (Delhi, 1988), 210-236.
- Sangwan, Satpal, 'Science Policy and the East India Company in India', in Rahman, A. (ed.), *Science and Technology in Indian Culture – a Historical Perspective* (New Delhi, 1984), 171-188.
- Sangwan, Satpal, *Science, Technology and Colonisation* (Delhi, 1991).
- Santapau, H., 'The Indian Botanic Garden in the first 175 years', *Bulletin of the Botanical Survey of India*, 7 (1965), I-VII.
- Schama, Simon, *Landscape and Memory* (London, 1995).
- Schiebinger, Londa and Claudia Swan, (eds), *Colonial Botany: Science, Commerce, and Politics in the Early Modern World* (Philadelphia, 2004).
- Schwarz, Bill, *White Man's World* (Oxford, 2011).
- Secord, Anne, 'Pressed into service: specimens, space, and seeing in botanical practice', in David N. Livingstone and Charles W. J. Withers, (eds.), *Geographies of Nineteenth-Century Science* (Chicago, 2011), 283–310.
- Secord, Anne, 'Botany on a Plate: Pleasure and the Power of Pictures in Promoting early Nineteenth Century Scientific Knowledge', *Isis* 93, no. 1 (2002), 28-57.
- Sen, S.N., 'The Character of Introduction of Western Science in India during the Eighteenth and Nineteenth Century', *Indian Journal of the History of Science*, Nov 1966, pp. 112-122.
- Sen, Samita and Das, Anirban, 'A History of the Calcutta Medical College and Hospital', in Uma Das Gupta & D.P. Chattopadhyaya (eds.), *Science and Modern India: an Institutional History, c.1784 - 1947* (Delhi, 2011).
- Shukla, Shabnam, 'The Calcutta Botanic Garden: Its Establishment and Ramifications - Robert Kyd to George King: 1787-1897', *Bengal Past & Present*, 113 (1994), 26-43.
- Shteir, Ann B., *Cultivating Women, Cultivating Science: Flora's Daughters and Botany in England, 1760-1860* (Baltimore, 1996).
- Sivasundaram, Sujit, *Islanded: Britain, Sri Lanka and the bounds of an Indian Ocean Colony* (Chicago, 2013).
- Sloan, Phillip R., 'Natural History, 1670-1802' in *Companion to the History of Modern Science*, (London, 1996).
- Thomas, Adrian, 'The Establishment of Calcutta Botanic Garden: Plant Transfer, Science and the East India Company', *Journal of the Royal Asiatic Society*, Series 3, 16, 2 (2006), 165-177.
- Thompson, Andrew S. (ed.), *Writing Imperial Histories* (Manchester, 2013).
- Thompson, Edward and Garratt, G.T., *Rise and Fulfilment of British Rule in India* (London, 1934).
- Tomlinson, B. R., *The Economy of Modern India* (Cambridge, 1993).
- Tosh, John, *A Man's Place: Masculinity and the Middle-Class Home in Victorian England* (New Haven, 1999).
- Travers, Robert, 'Death and the Nabob', *Past and Present*, 196, 1 (2007), 83-124.
- Vicziany, Marika, 'Imperialism, Botany and Statistics in Early Nineteenth-Century India: The Surveys of Francis Buchanan (1792-1829)', *Modern Asian Studies*, 20 (1986), 625.
- Welch, Stuart Cary, & Edwards, Phyllis, *A Selection of Late 18th and Early 19th Century Indian Botanical Paintings* (Pittsburgh, 1980).

- Wilson, Jon E., *The Domination of Strangers: Modern Governance in Eastern India, 1780-1835* (Basingstoke, 2008).
- Worboys, Michael, 'Science and the Colonial Empire', in Deepak Kumar (ed.), *Science and Empire*, (Delhi, 1991).
- Yeo, Richard, *Defining Science: William Whewell, Natural Knowledge and Public Debate in Early Victorian Britain* (Cambridge, 1993).
- Yeo, Richard, *Science in the Public Sphere: Natural Knowledge in British Culture 1800-1860* (Aldershot, 2001).

Literary works and fiction

- Ghosh, Amitav, *Sea of Poppies* (London, 2008).

Unpublished theses

- Bhagat, Usha, 'Botanic gardens and arboreta in India: a historical and contemporary Account,' (Cornell University M. Sc. thesis, 1958).
- Mukherjee, Abhijit, 'Natural Science in a Colonial Context: the Calcutta Botanic Garden and the Agri-Horticultural Society of India, 1787-1870', (Jadavpur University, Kolkata Ph D thesis, 1996).
- Nair, Savithri Preeta, 'The Museum in Colonial India (1770-1936)', (School of Oriental and African Studies, University of London Ph D thesis, 2002).
- Petrie, Ian C., 'Village visions: Science and technology in the Bengal countryside, c. 1860—1947' (University of Pennsylvania Ph D Thesis).
- Veale, Lucy, 'An historical geography of the Nilgiri cinchona plantations, 1860-1900' (University of Nottingham PhD thesis, 2010).

On-line sources

The East India Company and the Natural World, University of Sussex,
<http://www.sussex.ac.uk/cweh/research/eastindiacompany>

IHR: History in Focus – Empire,
<http://www.history.ac.uk/ihr/Focus/Empire/reviews/index.html#science>